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CORONA CR

MISSION SUMMARY

AND

TELEMETRY ANALYSIS

MISSION 1114

AGENA 1660/PAYLOAD CR-14

MAY 1971

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1.0 SUMMARY

Mission 1114 utilized a THORAD booster (SLV-2H) S/N 538, Agena vehicle 1660, and payload system CR-14. The CR-14 payload system contained panoramic cameras S/N 328 and 329, and DISIC camera S/N 1-R. Payload profile and additional component serial numbers are included in Figure 7-1.

Lift-off occurred at 13:06:00.5 PST on 24 March 1971 from Vandenberg, SLC-3 west pad. All payload ascent events were normal with In-flight Reset (door ejection), A/P-to Orbit mode, instrumentation switchover, and panoramic camera transfer to orbit mode occurring as programmed. The orbit attained was within the three sigma of predicted.

The normal mission plan was 8/11 days with an actual of 7/9 days due to an excessive usage of vehicle control gas and an Agena "H" Timer failure on Rev. 246.

The performance of Panoramic cameras S/N 328 and 329 was normal throughout the flight. The panoramic film supply was not exhausted due to an Agena vehicle "H" Timer failure during Rev. 246. A total of 450 cycles was not recovered from the supply.

The panoramic camera A-to-B Transfer Sequence was performed on Rev. 104 COOK and DISIC camera A-to-B Cut and Splice on Rev. 105 POGO. Both panoramic cameras and DISIC events were normal. The -1 mission recovery capsule was recovered by air catch on Rev. 115 at 1518 PST on 31 March 1971. The -2 mission recovery capsule was recovered by air catch on Rev. 260 at 1328 PST on 9 April 1971.

The clock system, command and instrumentation system, pressure make-up system, recovery systems, and the thermal environment were normal throughout the flight.

The early recovery of the -2 mission recovery capsule was necessitated due to the Agena vehicle "H" Timer failure on Rev. 246. The Life Boat recovery system timer was utilized for the -2 capsule recovery. All Life Boat systems performed satisfactorily.

On Rev. 159 Guam the first word loaded into the DSR was a 209 instead of a 201. The remaining thirty one (31) words loaded were correct. Post flight investigation of the problem revealed that the SILO decoder received an incomplete command message (SILO 311) because it was prematurely terminated due to a ground station problem. As a result the command was not executed and the SILO shift register in the Type 22 decoder was not cleared. The UNCLE Command system was then activated for DSR loading. During the first word of the 32 word DSR load a "One" bit from the SILO Type 22 decoder register was added to the DSR load from the Uncle Type 22 decoder register causing the first word of the DSR load to be a 209 instead of a 201. This was normal for the sequence of events that occurred during this command sequence.

2.0 SUBSYSTEM PERFORMANCE

2.1 Panoramic Cameras

Panoramic cameras S/N 328 and 329 performed normally during the -1 and -2 missions.

2.1.1 Film Consumption and Type

	FRAMES	
	Pan 328	Pan 329
Sample	20	41
Pre-Launch	119	120
-1 Mission	2988	2972
-2 Mission	2815	2800
Left on Orbit	220	229
Total	6162	6162

Film Supply Length and Type	
Pan 328	Pan 329
7800 Ft/3414	7800 Ft/3414
1000 Ft/3404	1000 Ft/3404
7500 Ft/3414	7500 Ft/3414
16,300 Ft Total	16,300 Ft Total

2.2 DISIC Camera

The DISIC camera system performed normally throughout the -1 and -2 missions.

2.2.1 Film Consumption

	Frames
	Terrain
Sample	26
Pre-Launch	91
-1 Mission	2457
-2 Mission	2550
Left on Orbit	164
Total	5288

Length/Type	
Terrain	Stellar
2200 Ft/3400	2000 Ft/3401

2.3 Command and Control

2.3.1 Command System

The real time command (RTC) system operation was satisfactory throughout the flight except for Rev. 159 Guam. On Rev. 159 Guam the SILO Command system malfunctioned during vehicle commanding making it necessary to load the DSR with the Uncle Command system. The first word loaded was a 209 instead of the desired 201. The balance of the load was correct. The DSR was then enabled prior to fade and was re-loaded correctly at 159 POGO. Post flight investigation of the problem revealed that the SILO decoder received an incomplete command message due to a ground station problem that caused a premature termination of the command. As a result, the last SILO command was not executed and the SILO shift register in the Type 22 decoder was not cleared. Therefore, when the DSR was loaded with the Uncle Command system the command words for the first word from both SILO and Uncle shift registers were added together resulting in the incorrect first word. This was normal for the Command Sequence that occurred on Rev. 159 Guam. Post event 2 testing was conducted to attempt to simulate a DSR problem without any malfunctions. (See Para. 5.0).

2.3.2 FMC Match

The Ramp to Orbit match was satisfactory throughout both missions. During 82.5% of the first mission operations and during 82.1% of the second mission operations, the mis-match error was less than 1.0%.

To compensate for the reduction of mission lifetime due to abnormal vehicle control gas usage, the orbit altitude was increased to minimize gas usage and hence extend mission life. The increase in altitude exceeded the pre-launch setting of the slope-programmer operating limits of 80.0 to 95.0 nautical miles. An improved ramp-to-orbit match would have been maintained if the operating limits had not been exceeded.

2.3.3 Exposure Control System

The slit width control programmer performed satisfactorily throughout the -1 and -2 missions.

2.4 Data System

2.4.1 Instrumentation

The instrumentation system performed satisfactorily throughout the -1 and -2 missions. Diagnostic data on Link Two (2) channel fifteen (15) appeared noisy after Rev. 43. Signal was "In and Out" for remainder of the mission. This anomaly was attributed to a problem in the Agena vehicle Link Two (2) signal strength.

2.4.2 Clock System

Mission 1114 payload clock performed satisfactorily throughout the flight. The correlation equation and constants are:

First Order Fit

System Time = $A_0 + A_1$ (Clock Time)

A_0 = -0.2767048117484806 D 05

A_1 = 0.9999997942584964 D 00

Sigma = 0.01117422

Number of Points 257

Second Order Fit

System Time = $A_0 + A_1$ (Clock Time) + A_2 (Clock Time)^2

A_0 = -0.2767052319235540 D 05

A_1 = 0.9999999195136654 D 00

A_2 = -0.7442426896944209 D -13

Sigma = 0.00247612

Number of Points 257

2.4.3 SRV Tape Recorder

The SRV tape recorders for the -1 and -2 missions performed satisfactorily. A total of 210.2 minutes of data was recorded and processed from the two recorders (104.6 minutes for the -1 mission and 105.6 minutes for the -2 mission). Problems with the Automatic Data Processor delayed transmission of the customer data tape by two days.

2.5 Recovery

2.5.1 -1 Mission

The -1 recovery capsule was successfully recovered by air catch on Rev. 115 at 1518 PST on 31 March, 1971. All re-entry events were within tolerance with the impact approximately 10 miles North of the predicted. Refer to Table 7.5.

	Actual	Predicted
Impact Location	(24°11'N/162° 0'W)	(24°1'N/162° 14'W)

2.5.2 -2 Mission

The -2 recovery capsule was successfully recovered by air catch on Rev. 260 at 1328 PST on 9 April, 1971. All re-entry events were within tolerance with the impact very near predicted. Refer to Table 7.5.

	Actual	Predicted
Impact Location	(17°58'N/153° 46'W)	(18°0'N/153° 58'W)

3.0 ORBITAL PERFORMANCE

3.1 Orbital Parameters

Parameter	Predicted	Tolerance	Actual STC	Actual APF
Period (Min.)	88.67	+.32,-.36	88.56	88.55
Perigee (N.M.)	84.5	+ 8, - 8	84.7	87.6
Apogee (N.M.)	145.9	+12, -16	144.8	142.2
Eccentricity	$88x10^{-4}$	$+23x10^{-4}$,$-30x10^{-4}$	$77x10^{-4}$	$75x10^{-4}$
Inclination (Deg.)	81.50	+.21,-.18	81.50	81.52
Arg. of Perigee (Deg.)	147	+63, -57	130.6	129.0
Regression Rate (Deg./Rev.)	22.31	- -	-	-
Perigee Latitude (Deg.)	33 N	+59, -66	-	-

3.2 DMU Operation

Ground Track and period control were maintained during the flight by firing five (5) of the twelve (12) 3000 lb.-sec. DMU rockets. Refer to Table 3.2.1. The ground track and period control was affected by the change in orbit altitude to provide access to specific targets.

The ground track error at the ascending node ranged from 27.0 nautical miles east of nominal to 174.0 nautical miles west of nominal.

The firing of DMU rockets supported requirements due to the vehicle problem and due to the special access requested by the customer.

TABLE 3.2.1

DMU PERFORMANCE

Rocket No.	Rev. No.	System Time (Sec)	Period Change (Sec)	Velocity Change (Ft./Sec.)	Period at Firing (Min.)	Impulse (Lb./Sec.)
1	27	47142	13.82	22.28	88.44	3072
2	48	4440	13.48	21.54	88.52	2974
3	134	Stepped	Over			
4	135	3972	15.35	24.55	88.31	3031
5	158	3957	15.45	24.71	88.43	3042
6	170	3927	15.40	24.60	88.63	3006

4.0 ENVIRONMENTAL CONTROL

4.1 Pressure Make-Up System

The pressure make-up system (PMU) operated properly throughout the flight. There were 109 panoramic camera operates for a total of 188.3 minutes which resulted in a gas consumption rate of 4.9 lbs/min of operate time. There were 262 DISIC camera operates for a total of 609.4 minutes for an alternate level gas consumption rate of 1.43 lbs/min of operate time.

4.2 Thermal Environment

The temperature data obtained during this flight indicated the temperature environment was within the pre-flight predictions for the duration of the flight. The averages of the panoramic camera temperatures ranged from 60°F to 62°F for S/N 328 and from 59°F to 64°F for S/N 329 during the -1 mission and 57°F to 64°F for S/N 328 and 59°F to 63°F for S/N 329 during the -2 mission. Refer to Tables 7.8.1 and 7.9.1 thru 7.9.4.

The on-orbit temperature profiles for Revs. 8, 105, and 186 are included in Figures 7.8.2 thru 7.8.14.

5.0 POST EVENT 2 TESTING

The Digital Storage Register (DSR) was loaded forty (40) times from various tracking stations in an attempt to repeat the anomaly that occurred on Rev. 159 Guam. No DSR loading malfunction occurred in any of the forty (40) loads.

6.0 HARDWARE DEFINITIONS

6.1 Agena

FTV 1660 was an Agena vehicle (SS-01B) and a THORAD Booster (SLV-2H) S/N 538. The Agena was oriented nose first with the following configuration:

1) Twelve Thiokol DMU rockets. All Thiokol DMU rockets were 3000 lb-sec.
2) Three primary control gas spheres installed with -5 heavy control gas mixture.
3) -3 payload system with digital storage register (DSR) and capability of accepting both Silo and Uncle commands.
4) Ten panel, single wing, solar array system with two (2) 1H batteries. (Depleting system).
5) AFT payload-Doppler Beacon No. 5 and OTEX A & B, Six Silo/Uncle commands for real time Doppler Beacon Control and Brush 18 (Doppler Beacon ON) and Brush 16 (Doppler Beacon OFF).
6) 3/4 speed Type VIII programmer (325 subcycles).
7) FTV 1660 was the second vehicle to utilize High Density Acid (oxidizer) and new fuel Hyperzine 300 (instead of IRFNA and UDMH).

6.2 Payload

The CR-14 payload configuration included the following:

1) Panoramic Camera

   a) Constant rotating type with a servo-controlled supply cassette.

   b) Digital Storage Register (DSR)/Cascade system utilized for camera enable/disable.

   c) Emergency program back-up available by RTC.

      UHF 116/SILO 316 Emergency Program Select
      UHF 118/SILO 318 Emergency Intermix Select
      UHF 120/SILO 320 Emergency Mode Select

   d) Exposure Control

      1. Programmer control by SPC (51, 52, 17) and RTC UHF 105/SILO 305.

      2. Automatic slit width control. Override by RTC UHF 101-126/SILO 301-326.

   e) Filter Selection

      1. Control by RTC UHF 103-104/SILO 303-304

      2. The automatic filter change capability through the material change detector (MCD), was disconnected prior to launch.

   f) Payload hardware modifications unique to this system.

      1. The end of scan switch is now in series with the stow switch. Previously these switches were in parallel.

      2. The instrument switch cluster has a 7-second timer added for back-up to the 20 second shutdown timer.

2) DISIC Camera

    a) Mode select controlled by RTC UHF 124/SILO 324.

    b) Both slave and independent modes of operation had a 1:1 ratio of stellar to terrain frames.

    c) Operate off provided by RTC UHF 107/SILO 307.

3) FMC Programmer

    a) Initiated by SPC 14 and SPC 27.

    b) Control delay increment by RTC UHF 125/SILO 325.

    c) Ramp profile provided by:

    UHF 121/SILO 321 Eccentricity start level
    UHF 122/SILO 322 Eccentricity half cycle level

4) Pressure Make-Up System

    a) Enable/Disable controlled by RTC UHF 110/SILO 310.

    b) Two (2) bottle system with dual range capability

    c) PMU operation in low range with DISIC independent mode of operation.

5) Panoramic camera "A" to "B" Transfer available by RTC KIK-SILO 38.

6) DISIC camera "A" to "B" Transfer available by RTC KIK-SILO 39.

7) Yaw steering available by RTC UHF 106/SILO 306.

8) Agena tape recorder time shared with vehicle data.

9) SRV tape recorder available in -1 and -2 recovery capsules.

10) Payload weight: EWO = 1810 lbs.

11) Instrumentation: RTC UHF 127/SILO 327 operational-diagnostic data select.

12) Thermal configuration: The top black was reduced to 56 degrees on the fairing and 76 degrees on the barrel and conic.

13) Command system included a DSR for primary operation of the camera system with a two program/4 rev. intermix emergency capability.

6.3 Camera and Programmer Settings

6.3.1 Panoramic Cameras

	S/N 328	S/N 329
Filter Type		
Primary	W/23, .037 Glass	W/25, .037 Glass
Alternate	W/23, .040 Glass	W/25, .040 Glass
Slit Width (Inches)		
Position 1	0.115	0.144
Position 2	0.145	0.177
Position 3	0.178	0.218
Position 4	0.283	0.308
Failsafe	0.155	0.190

Auxiliary Optics	Take-Up	Supply	Take-Up	Supply
Filter	W-25	W-25	W-25	W-25
Aperture	F6.3	F8.0	F8.0	F6.3

6.3.2 DISIC Camera

	Steller	Terrain
Filter	None	W-12
Aperture	F2.8	F6.3
Cycle Period	9.375	9.375

6.3.3 Exposure Control Settings

	Seconds
T-1 (20 second Increment) initial setting	100
T-2 DISIC Exposure to 1/500	320
T-3 Slit Position 3 Duration	40
T-4 Slit Position 2 Duration	240
T-5 DISIC Exposure to 1/250	320
T-6 (T6 △ -T1)	320

DISIC exposure time was constant at 1/500 second for this mission. No system function was controlled by T2 or T5. Position parameters were used to facilitate T/M monitoring

6.3.4 FMC Control Settings

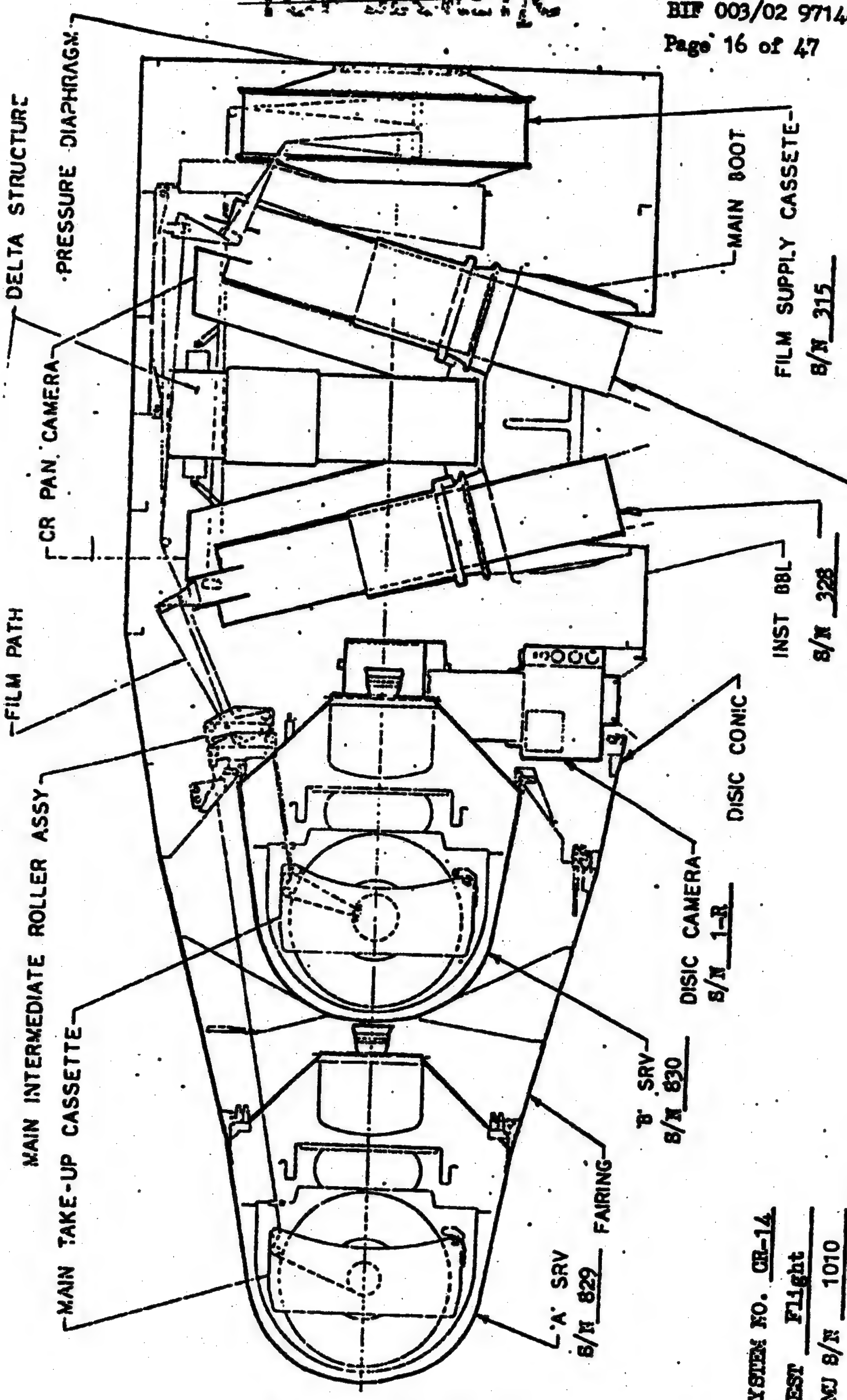
Eccentricity function

1) Period - 4188 seconds
2) Delay step increment - 50 seconds

Oblateness function

1) Period - 5248 seconds
2) Gain factor - 0.1136

2. PAYLOAD PROFILE AND SERIAL NUMBERS



SYSTEM NO. CR-14
TEST Flight
PMU S/N 1010
SLOPE PROGRAMMER S/N 217
CLOCK S/N 629
SWITCH PROGRAMMER S/N 217

FIGURE 7.1

							INST. 328			INST. 329			
REV	P R	O P	S 1/2 POS.	SYSTEM CALIB.	OBL TUR	ECC TUR	ACTUAL PERIOD	UNIT DEV.	SYSTEM DEV.	ACTUAL PERIOD	UNIT DEV.	SYSTEM DEV.	328/3 DIFF
9	0	0	2 14	2.526	1845	743	2.512	0.57F	0.57F	2.527	0.03S	0.03S	-0.6
32	0	0	1 13	1.852	3476	2301	1.835	0.91F	0.93F	1.840	0.68F	0.66F	-0.2
48	0	0	1 15	1.834	3557	2438	1.822	0.61F	0.64F	1.831	0.17F	0.15F	-0.4
97	0	0	4 4	2.075	3341	2424	2.058	0.79F	0.80F	2.062	0.62F	0.61F	-0.1
129	0	0	5 8	2.008	3374	2538	1.995	0.65F	0.67F	2.000	0.43F	0.42F	-0.2
161	0	0	2 1	2.084	3462	2020	2.075	0.42F	0.43F	2.083	0.06F	0.04F	-0.3
226	0	0	3 3	2.080	3390	2388	2.080	0.01S	0.01F	2.080	0.02F	0.01F	0.0

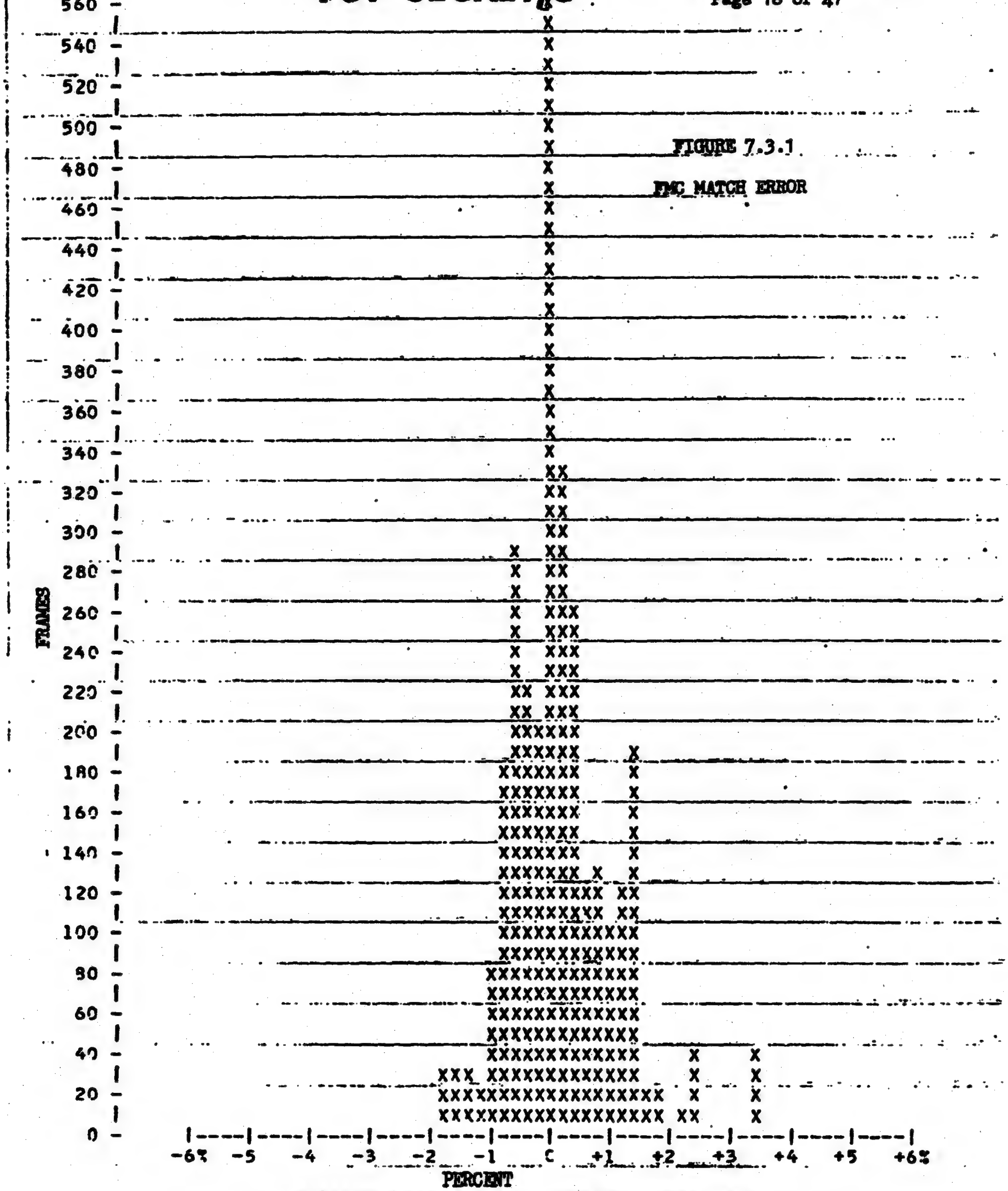
NOTE: "F" = FAST and "S" = SLOW from the calibrated value

TABLE 7.2

PANORAMIC CAMERA CYCLE RATE ERRORS

FIGURE 7.3.1

FMC MATCH ERROR



MISSION 1114-1 AFT LOOKING--ORBIT MATCH
MEAN= 0.16 ONE SIGMA= 0.84 TOTAL FRAMES=2988
2470 FRAMES MATCHED ORBIT +/- 1%, REPRESENTS 82.66%, OF THE MISSION

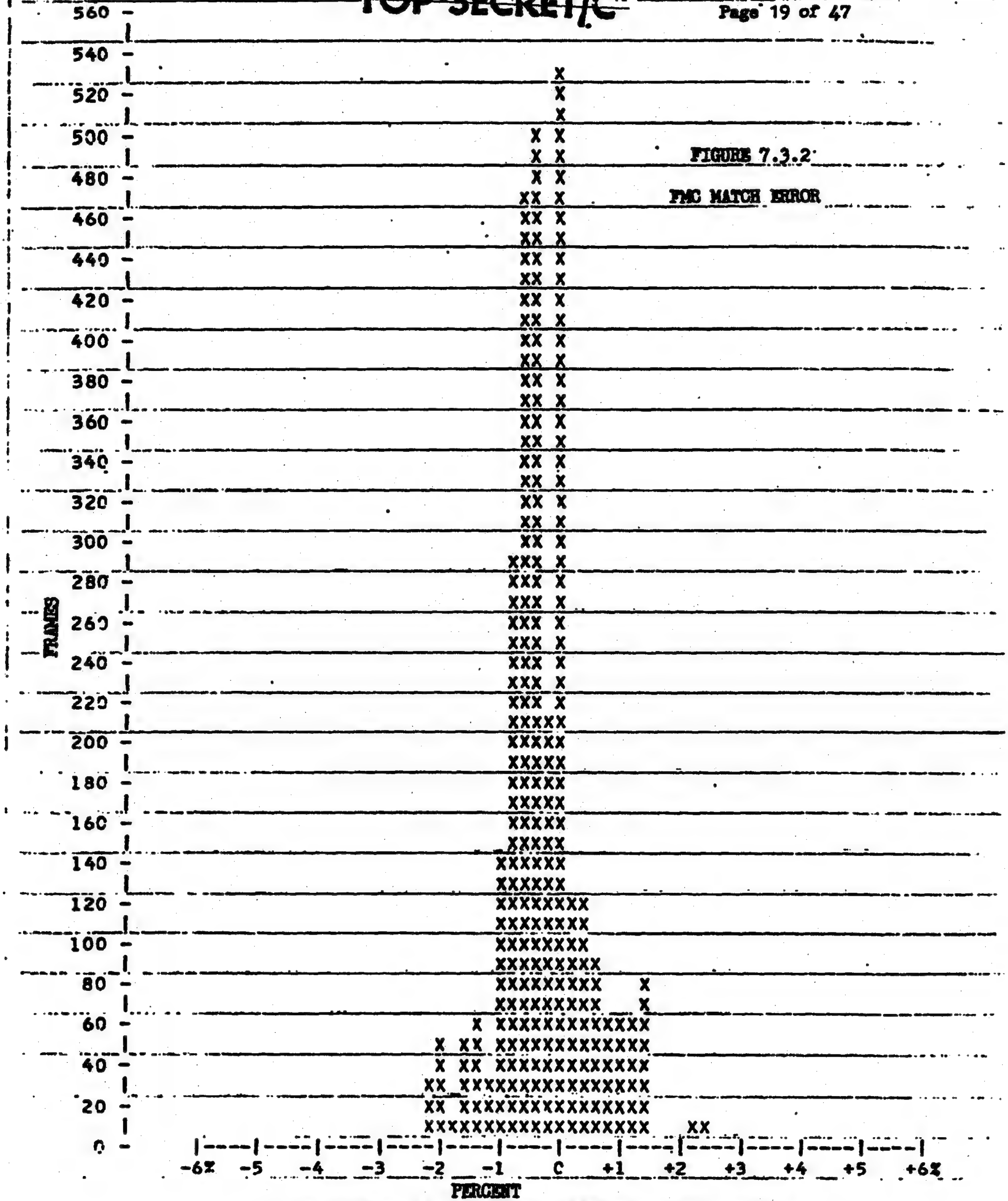


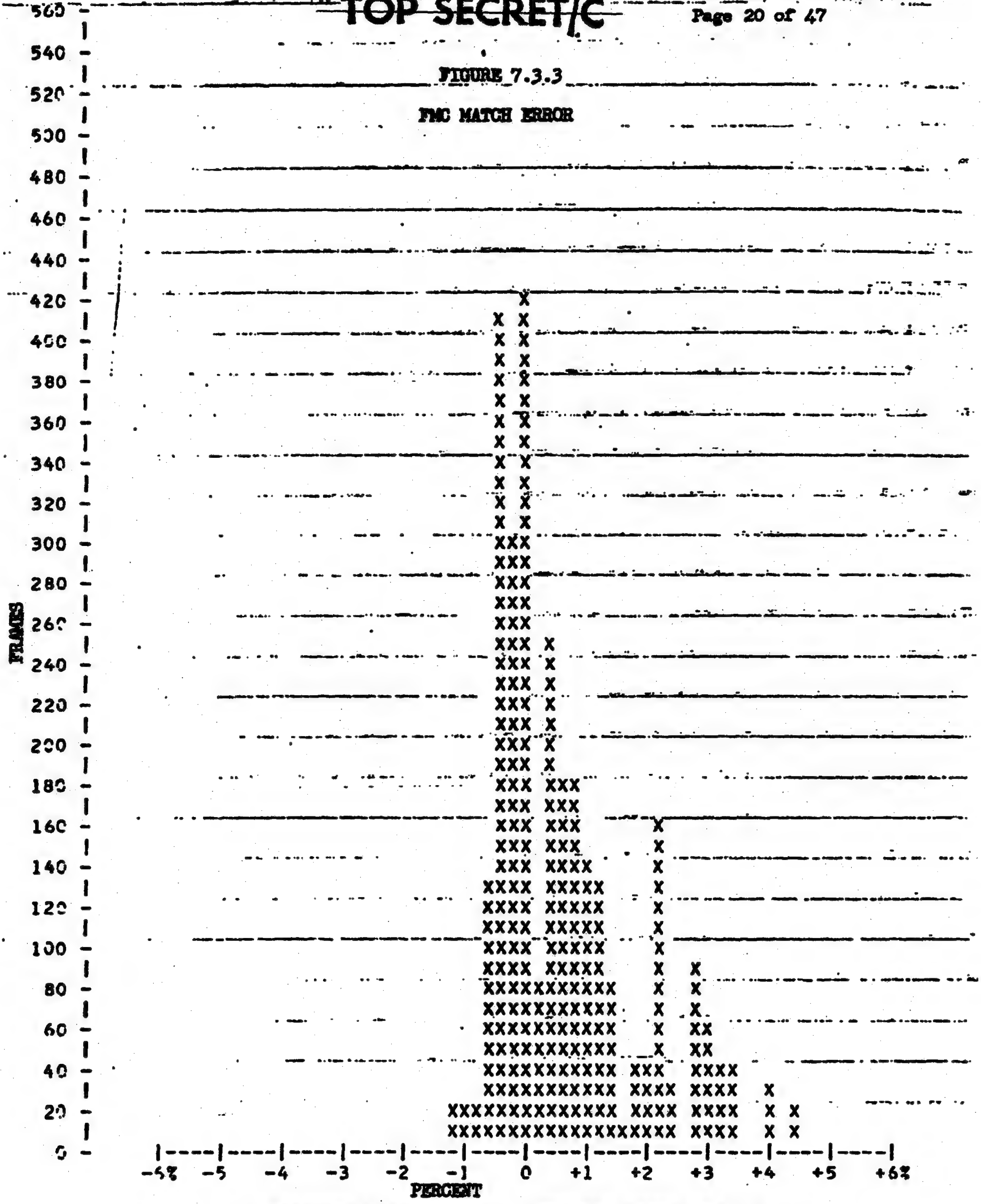
FIGURE 7.3.2

FMC MATCH ERROR

MISSION 1114-1 FWD LOOKING—ORBIT MATCH
MEAN=-0.28 ONE SIGMA= 0.72 TOTAL FRAMES=2972
2584 FRAMES MATCHED ORBIT +/- 1%, REPRESENTS 86.94%, OF THE MISSION

FIGURE 7.3.3

FMC MATCH ERROR



MISSION 1114-2 AFT LOOKING--ORBIT MATCH

MEAN= 0.65 ONE SIGMA= 1.16 TOTAL FRAMES=2918

2123 FRAMES MATCHED ORBIT +/- 1%, REPRESENTS 72.76%, OF THE MISSION

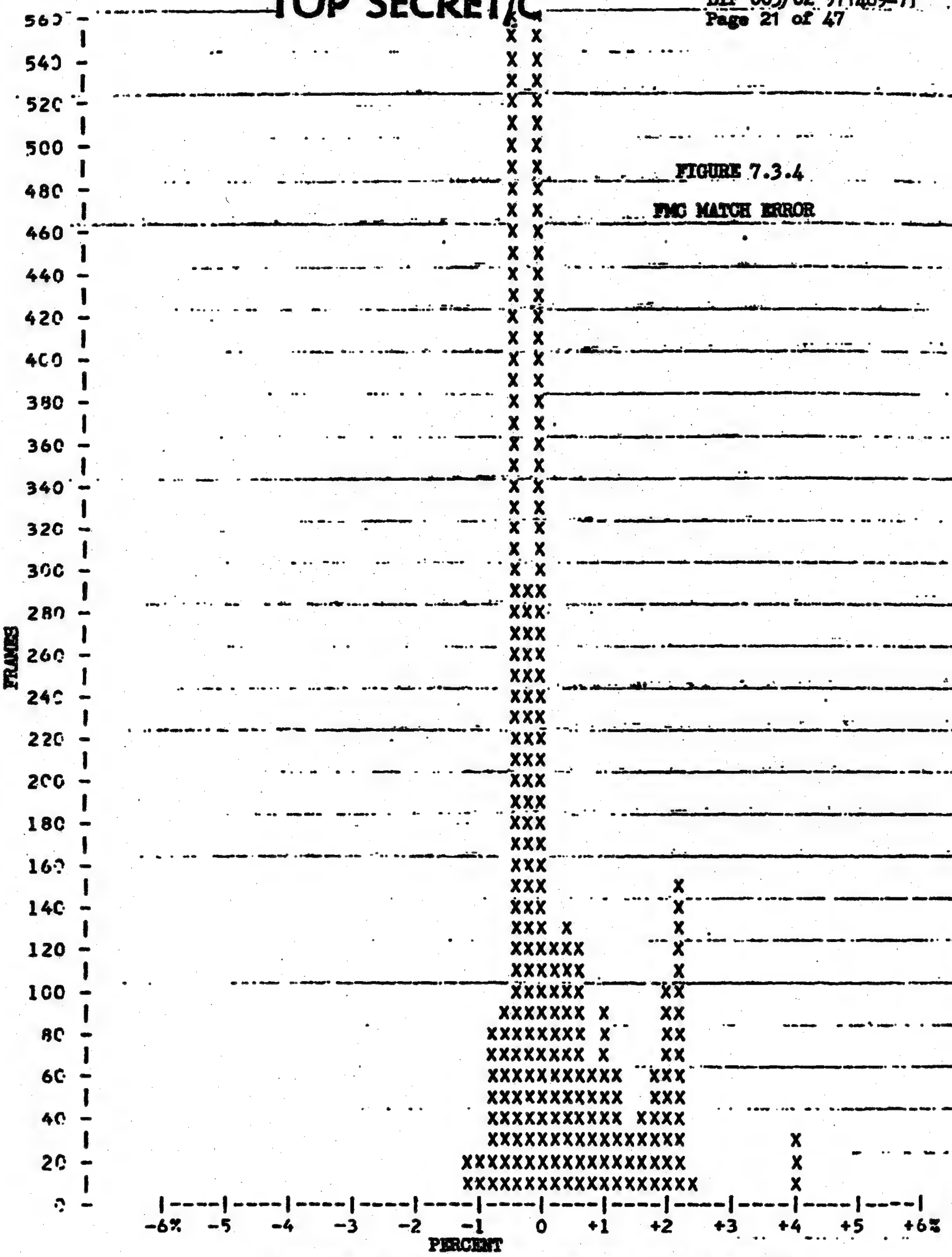


FIGURE 7.3.4

FMC MATCH ERROR

MISSION 1114-2 FWD LOOKING--ORBIT MATCH

MEAN= 0.26 ONE SIGMA= 0.89 TOTAL FRAMES=2902

2394 FRAMES MATCHED ORBIT +/- 1%, REPRESENTS 82.49%, OF THE MISSION

MISSION 1114-2 AFT LOOKING, TOTAL FRAME COUNT- 2918

FRAME FREQUENCY DISTRIBUTION BETWEEN -6% AND +6% ORBIT MATCH

DISTRIBUTION OVER 61 POINTS INCREMENTED AT .2 PERCENT

PERCENT-FRAMES		PERCENT-FRAMES	
		0.0	417
-0.2	296	0.2	80
-0.4	405	0.4	251
-0.6	134	0.6	182
-0.8	24	0.8	175
-1.0	24	1.0	135
-1.2	24	1.2	133
-1.4	0	1.4	79
-1.6	0	1.6	11
-1.8	0	1.8	40
-2.0	0	2.0	39
-2.2	0	2.2	160
-2.4	0	2.4	33
-2.6	0	2.6	0
-2.8	0	2.8	94
-3.0	0	3.0	60
-3.2	0	3.2	37
-3.4	0	3.4	36
-3.6	0	3.6	0
-3.8	0	3.8	0
-4.0	0	4.0	25
-4.2	0	4.2	0
-4.4	0	4.4	24
-4.6	0	4.6	0
-4.8	0	4.8	0
-5.0	0	5.0	0
-5.2	0	5.2	0
-5.4	0	5.4	0
-5.6	0	5.6	0
-5.8	0	5.8	0
-6.0	0	6.0	0

TABLE 7.4.1

MISSION 1114-2 FWD LOOKING, TOTAL FRAME COUNT- 2902

FRAME FREQUENCY DISTRIBUTION BETWEEN -6% AND +6% ORBIT MATCH

DISTRIBUTION OVER 61 POINTS INCREMENTED AT .2 PERCENT

PERCENT	FRAMES	PERCENT	FRAMES
		0.0	731
-0.2	285	0.2	118
-0.4	674	0.4	127
-0.6	93	0.6	119
-0.8	75	0.8	55
-1.0	24	1.0	93
-1.2	24	1.2	61
-1.4	0	1.4	33
-1.6	0	1.6	39
-1.8	0	1.8	63
-2.0	0	2.0	101
-2.2	0	2.2	148
-2.4	0	2.4	14
-2.6	0	2.6	0
-2.8	0	2.8	0
-3.0	0	3.0	0
-3.2	0	3.2	0
-3.4	0	3.4	0
-3.6	0	3.6	0
-3.8	0	3.8	0
-4.0	0	4.0	25
-4.2	0	4.2	0
-4.4	0	4.4	0
-4.6	0	4.6	0
-4.8	0	4.8	0
-5.0	0	5.0	0
-5.2	0	5.2	0
-5.4	0	5.4	0
-5.6	0	5.6	0
-5.8	0	5.8	0
-6.0	0	6.0	0

TABLE 7.4.2

MISSION 1114-1 AFT LOOKING, TOTAL FRAME COUNT- 2988

FRAME FREQUENCY DISTRIBUTION BETWEEN -6% AND +6% ORBIT MATCH

DISTRIBUTION OVER 61 POINTS INCREMENTED AT .2 PERCENT

PERCENT	FRAMES	PERCENT	FRAMES
		0.0	586
-0.2	195	0.2	333
-0.4	218	0.4	263
-0.6	285	0.6	116
-0.8	175	0.8	125
-1.0	75	1.0	99
-1.2	17	1.2	118
-1.4	26	1.4	185
-1.6	26	1.6	16
-1.8	26	1.8	16
-2.0	0	2.0	0
-2.2	0	2.2	11
-2.4	0	2.4	41
-2.6	0	2.6	0
-2.8	0	2.8	0
-3.0	0	3.0	0
-3.2	0	3.2	0
-3.4	0	3.4	36
-3.6	0	3.6	0
-3.8	0	3.8	0
-4.0	0	4.0	0
-4.2	0	4.2	0
-4.4	0	4.4	0
-4.6	0	4.6	0
-4.8	0	4.8	0
-5.0	0	5.0	0
-5.2	0	5.2	0
-5.4	0	5.4	0
-5.6	0	5.6	0
-5.8	0	5.8	0
-6.0	0	6.0	0

TABLE 7.4.3

MISSION 1114-1 FWD LOOKING, TOTAL FRAME COUNT- 2972

FRAME FREQUENCY DISTRIBUTION BETWEEN -6% AND +6% ORBIT MATCH

DISTRIBUTION OVER 61 POINTS INCREMENTED AT .2 PERCENT

PERCENT	FRAMES	PERCENT	FRAMES
		0.0	532
-0.2	210	0.2	121
-0.4	503	0.4	115
-0.6	469	0.6	91
-0.8	288	0.8	60
-1.0	137	1.0	58
-1.2	31	1.2	57
-1.4	55	1.4	75
-1.6	54	1.6	0
-1.8	13	1.8	0
-2.0	48	2.0	0
-2.2	34	2.2	11
-2.4	0	2.4	10
-2.6	0	2.6	0
-2.8	0	2.8	0
-3.0	0	3.0	0
-3.2	0	3.2	0
-3.4	0	3.4	0
-3.6	0	3.6	0
-3.8	0	3.8	0
-4.0	0	4.0	0
-4.2	0	4.2	0
-4.4	0	4.4	0
-4.6	0	4.6	0
-4.8	0	4.8	0
-5.0	0	5.0	0
-5.2	0	5.2	0
-5.4	0	5.4	0
-5.6	0	5.6	0
-5.8	0	5.8	0
-6.0	0	6.0	0

TABLE 7.4.4

RE-ENTRY SEQUENCE OF EVENTS

Event	Delta Time (Seconds) Nominal	Unit #1	Unit #2
D-Timer Start	0	0	0
Arm	6.0 ± .5	6.0	6.0
Transfer	81.0 ± .5	80.87	80.88
Elec. Disconnect	82.0 ± .5	81.83	81.88
Separation	83.0 ± .5	82.86	82.87
Spin	3.40 ± .30	3.27	3.41
Retro	7.55 ± .45	7.64	7.54
Despin	10.75 ± .54	10.83	10.64
Thrust Cone Sep.	1.50 ± .15	1.33	1.50
"G" Switch Open			
Parachute Cover Ejec.	26.0 ± 1.5	25.93	26.10
Deceleration Chute Deploy	.58 ± .08	.55	.54
Ablative Shell Discon.	.58 ± .08	.55	.54
Main Chute Bag Sep.	10.25 ± 1.5	10.28	10.06
Main Chute Deploy	.52 ± .13	.54	.56
Main Chute Disreef	4.50 ± .80	4.54	4.23
K-10 Reset	28.0 ± 1.9	27.85	28.21

TABLE 7.5

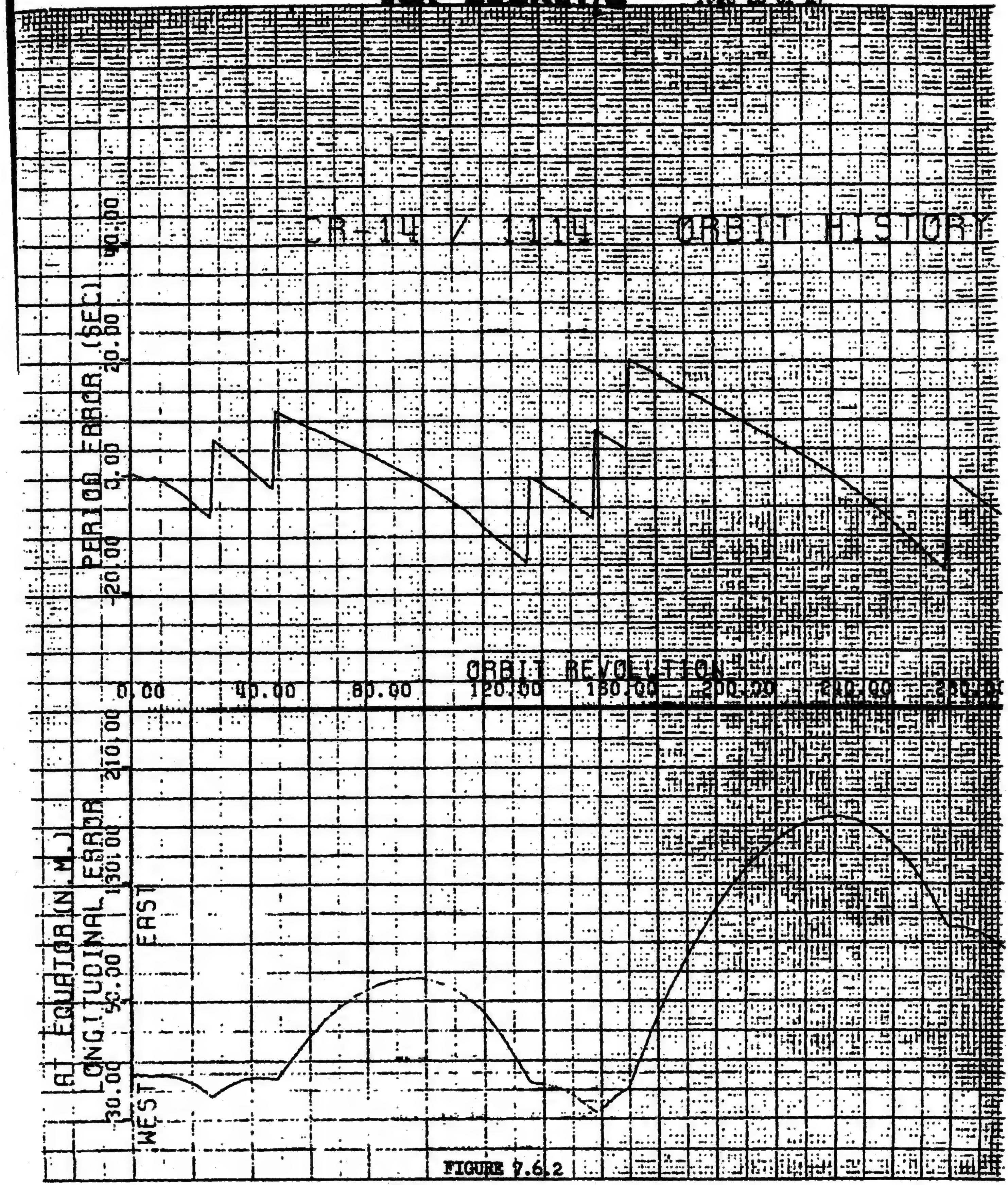

CR-14 / 1114 ORBIT HISTORY
PERIOD ERROR (SEC)
-20.00
0.00
20.00
40.00
ORBIT REVOLUTION
0.00
40.00
80.00
120.00
160.00
200.00
240.00
280.00
AT EQUATOR (N.M.)
LONGITUDINAL ERROR
-30.00
50.00
130.00
210.00
EAST
WEST

FIGURE 7.6.2

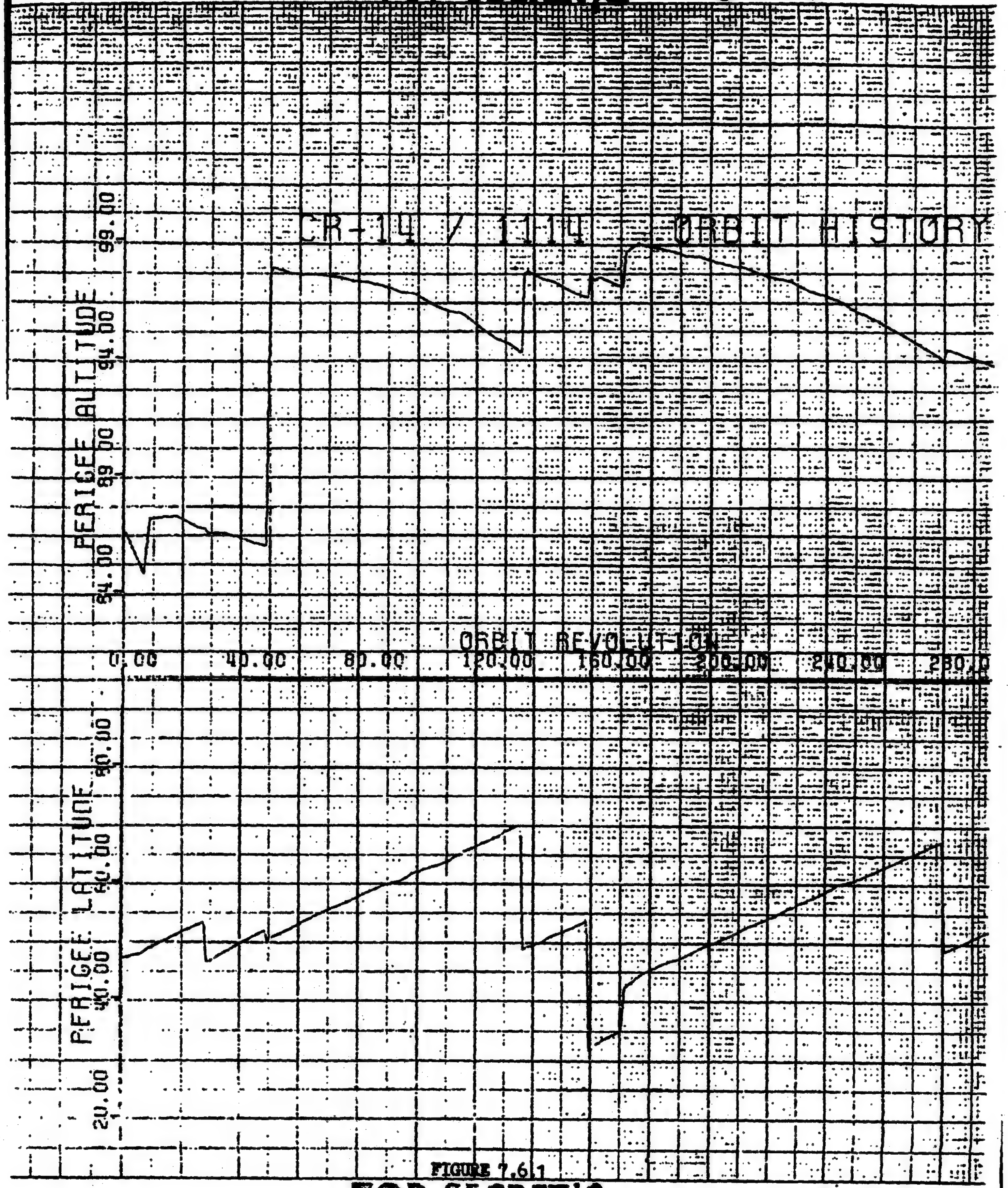

CR-14 / 1114 ORBIT HISTORY
PERIGEE ALTITUDE
99.00
94.00
89.00
84.00
ORBIT REVOLUTION
0.00
40.00
80.00
120.00
160.00
200.00
240.00
280.0
PERIGEE LATITUDE
80.00
60.00
40.00
20.00

FIGURE 7.6.1

CR-14/1114/1660

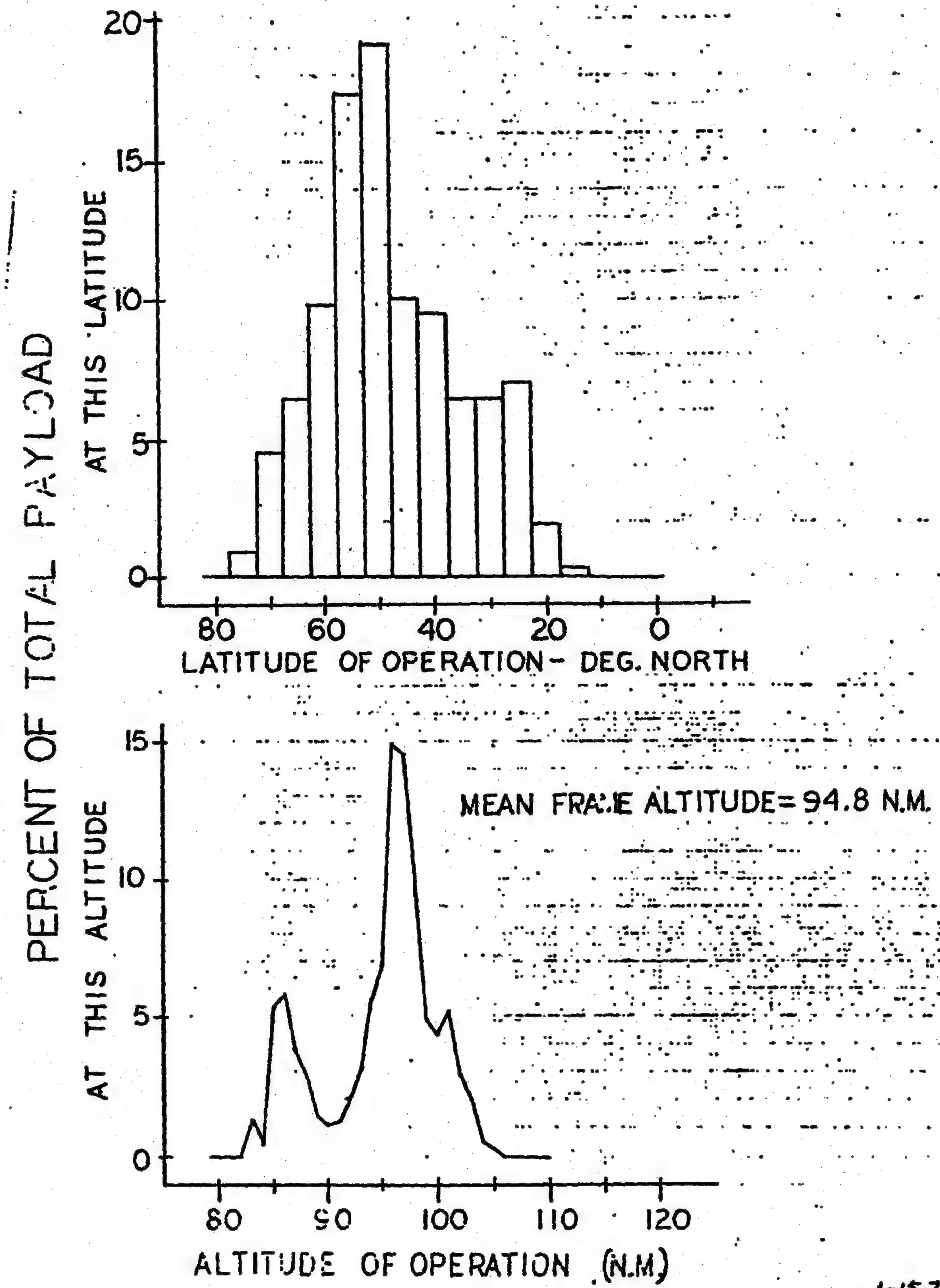


FIGURE 7.7

4-15-71

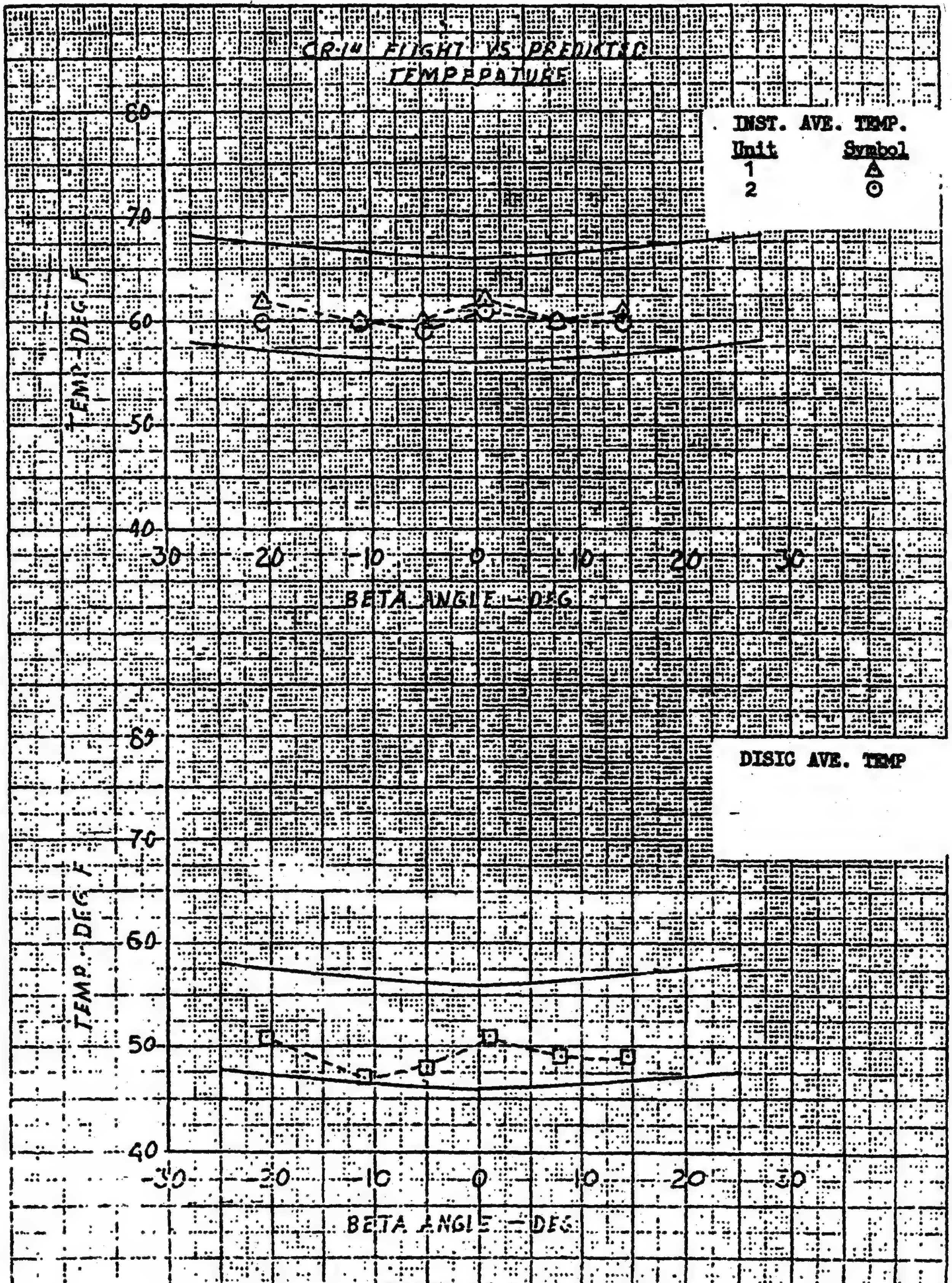


FIGURE 7.8.1

EUGENE DIETZGEN CO.
MADE IN U.S.A.
NO. 340-MP DIETZGEN GRAPH PAPER
MILLIMETER

TOP SECRET/C

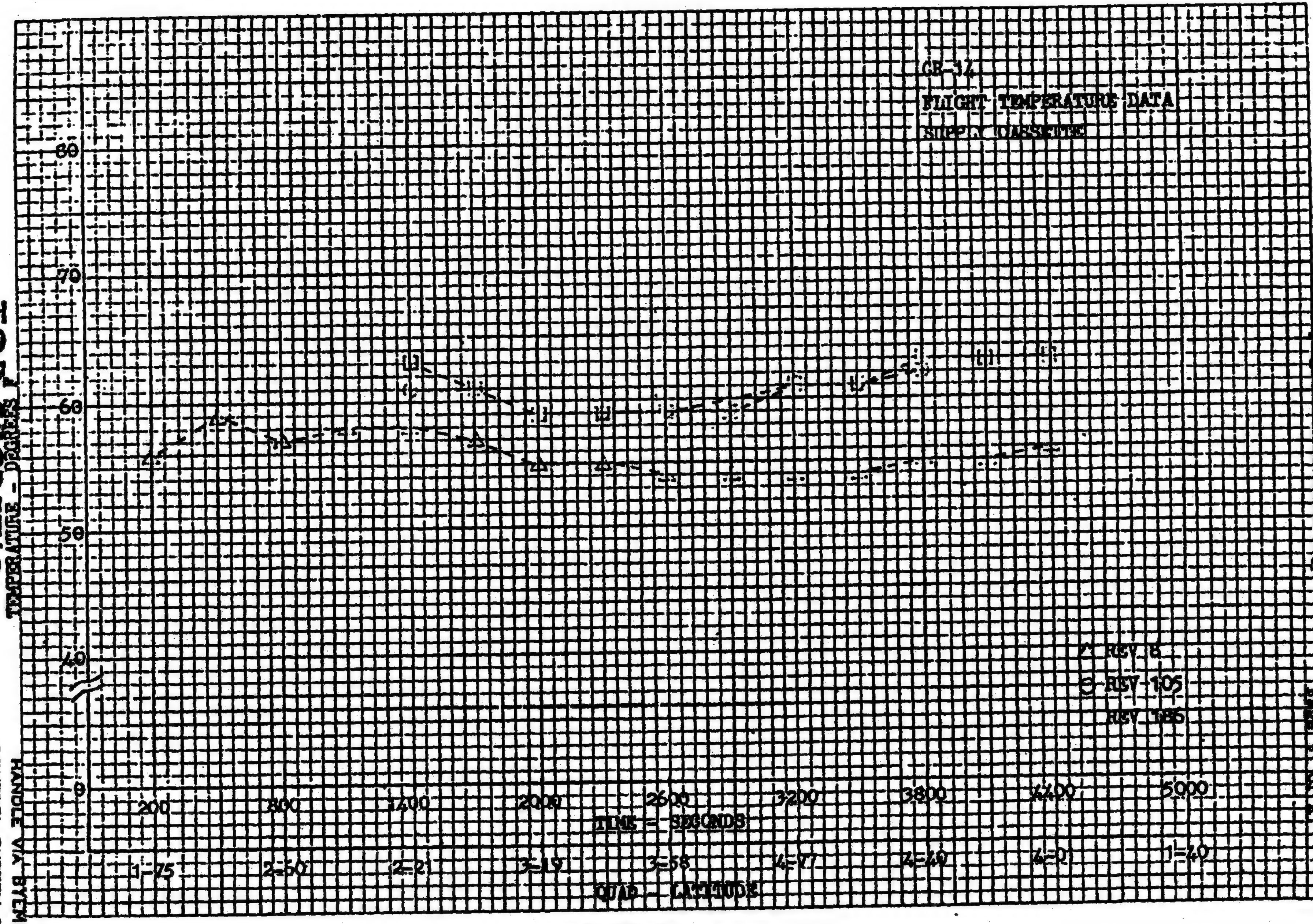


FIGURE 7.8.2

TOP SECRET/C

HANDLE VIA BYEMAN
CONTROL SYSTEM ONLY

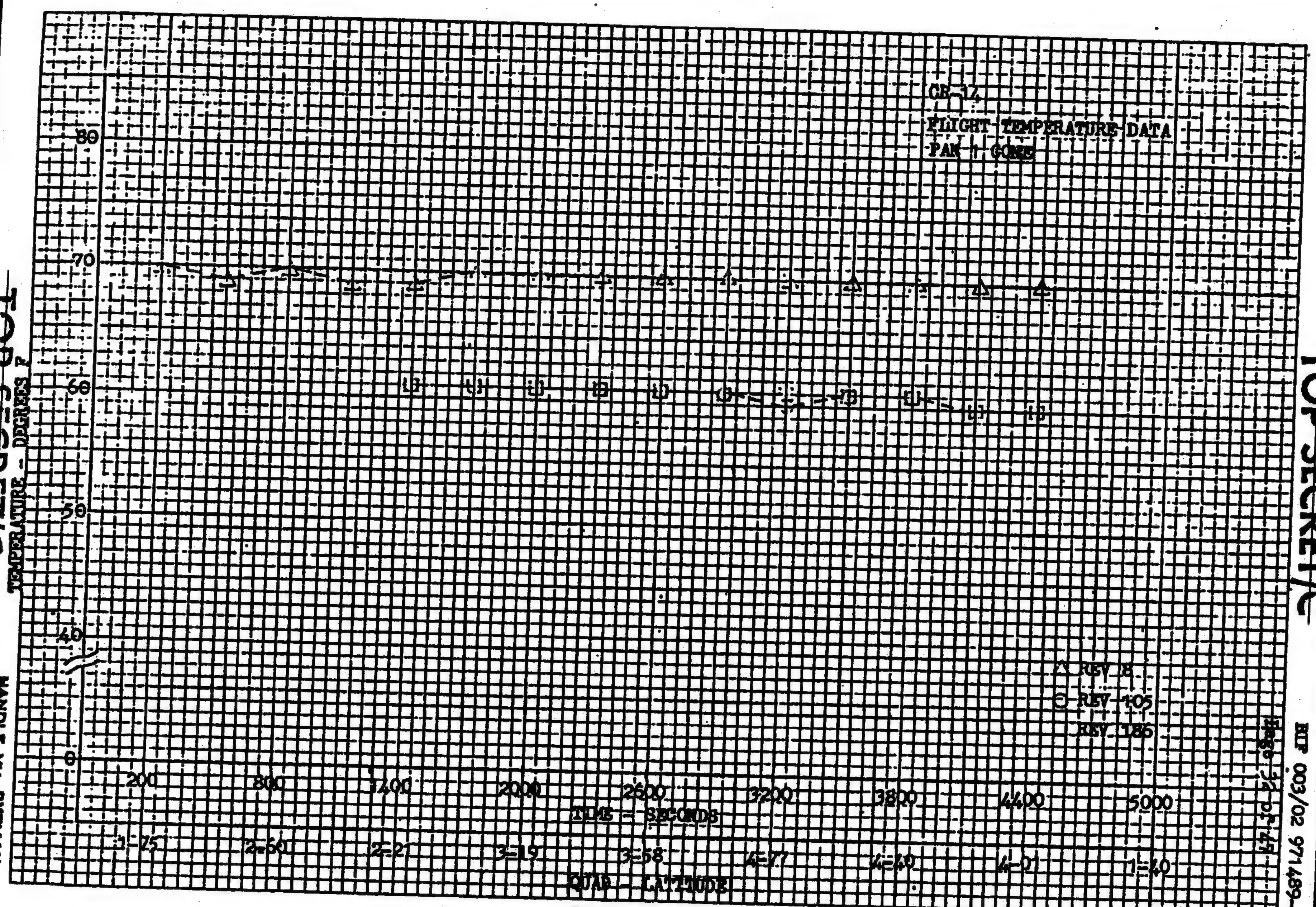

CR-14
FLIGHT TEMPERATURE DATA
PAN + CONE
TEMPERATURE - DEGREES F
80
70
60
50
40
0
△ REV 8
○ REV 105
REV 186
200
800
1400
2000
2600
3200
3800
4400
5000
TIME - SECONDS
1-75
2-60
2-21
3-19
3-58
4-77
4-40
4-01
1-40
QUAD - LATITUDE

FIGURE 7.8.3

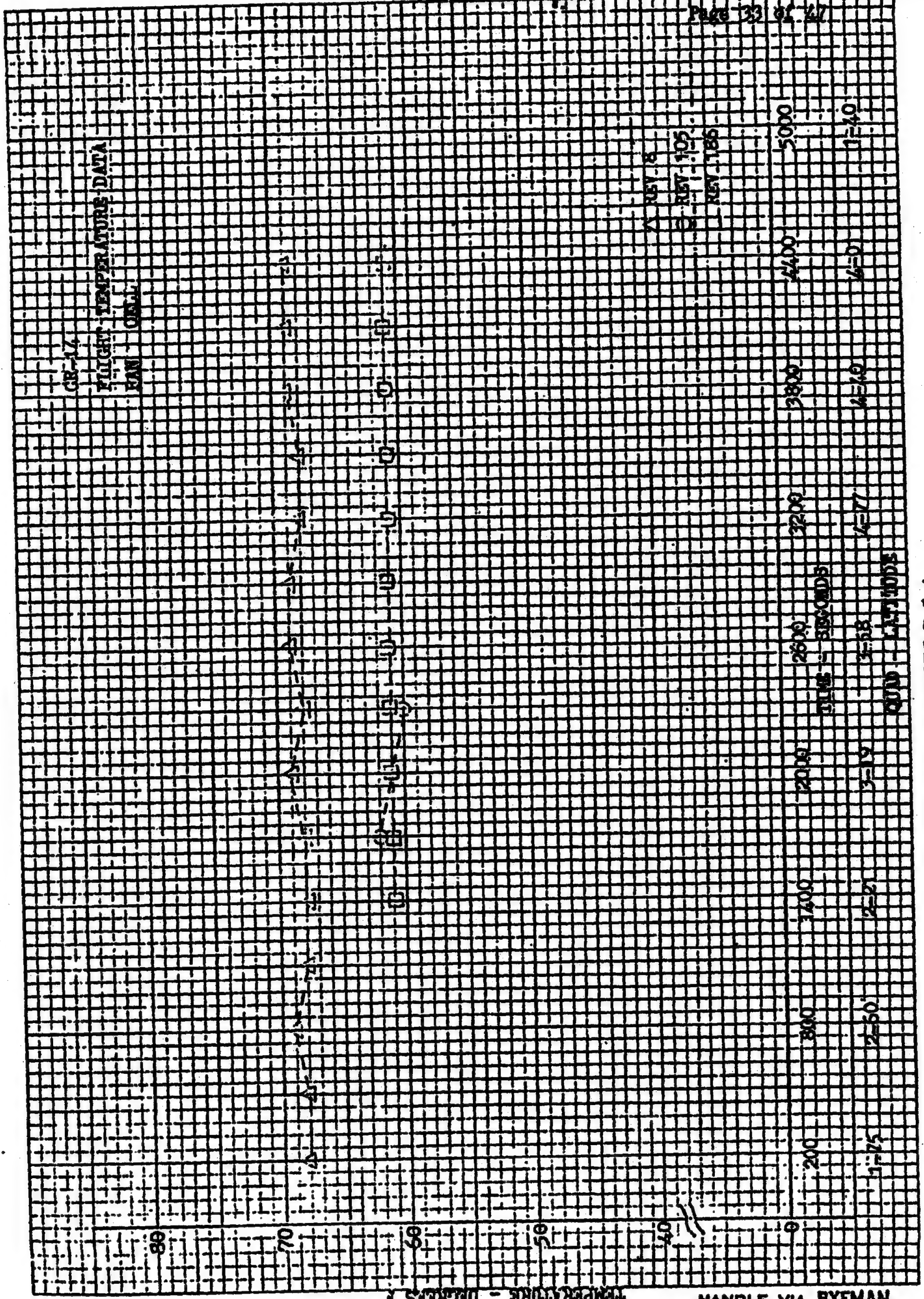

CR-17
FLIGHT TEMPERATURE DATA
FAN CELL
△ REV 18
◯ REV 105
— REV 186
TEMPERATURE - DEGREES F
80
70
60
50
40
0
200
800
1400
2000
2600
3200
3800
4400
5000
TIME - SECONDS
1-75
2-50
2-21
3-19
3-58
4-77
4-40
4-0
1-40
QUAD - LATITUDE

FIGURE 7.8.4

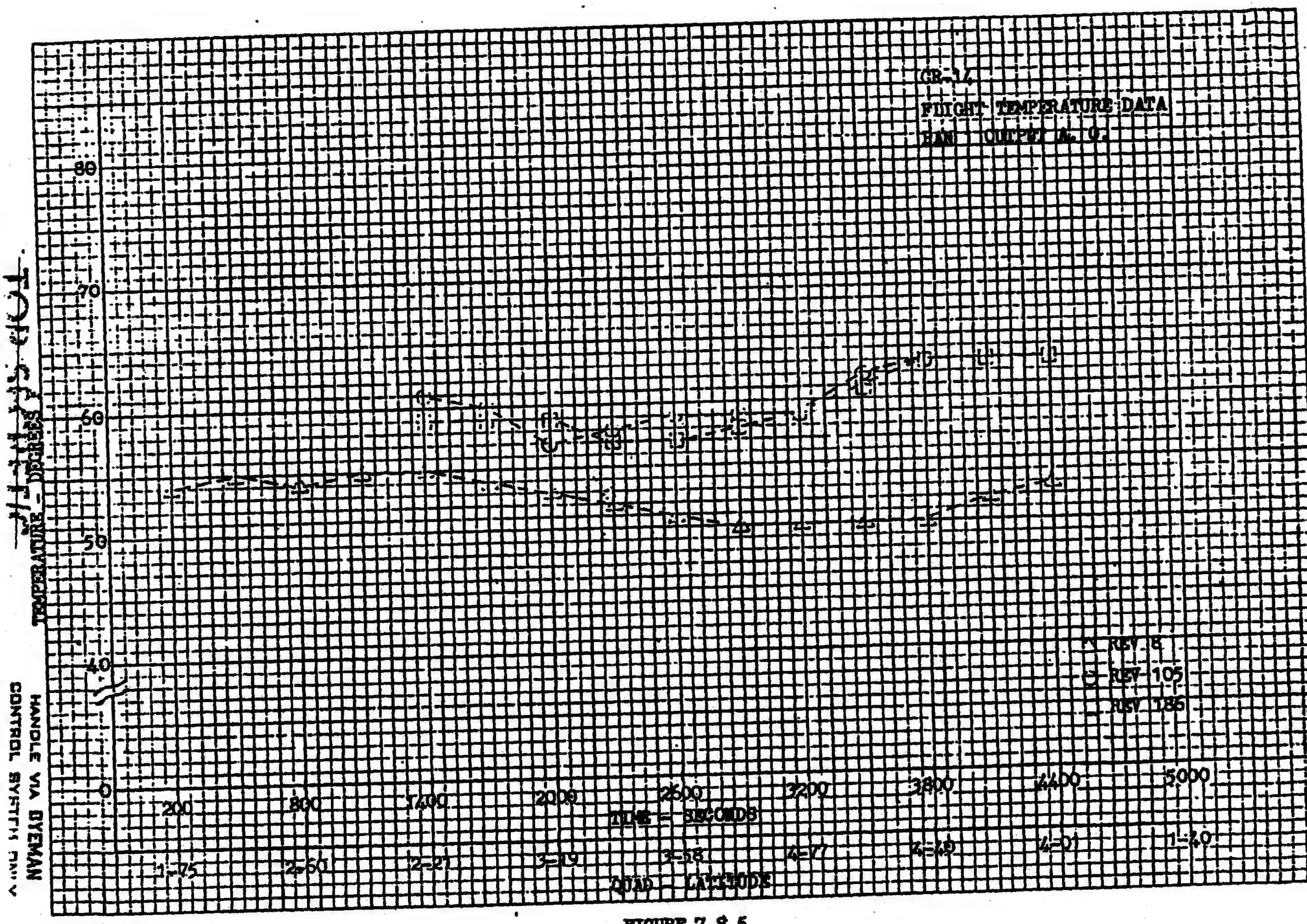

GR-14
FLIGHT TEMPERATURE DATA
HAN OUTPUT A. O.
△ REV 8
☐ REV 105
REV 186
TEMPERATURE - DEGREES F
80
70
60
50
40
0
200
800
1400
2000
2600
3200
3800
4400
5000
TIME - SECONDS
1-75
2-60
2-27
3-19
3-58
4-77
4-49
4-01
1-40
QUAD - LATITUDE

FIGURE 7.8.5

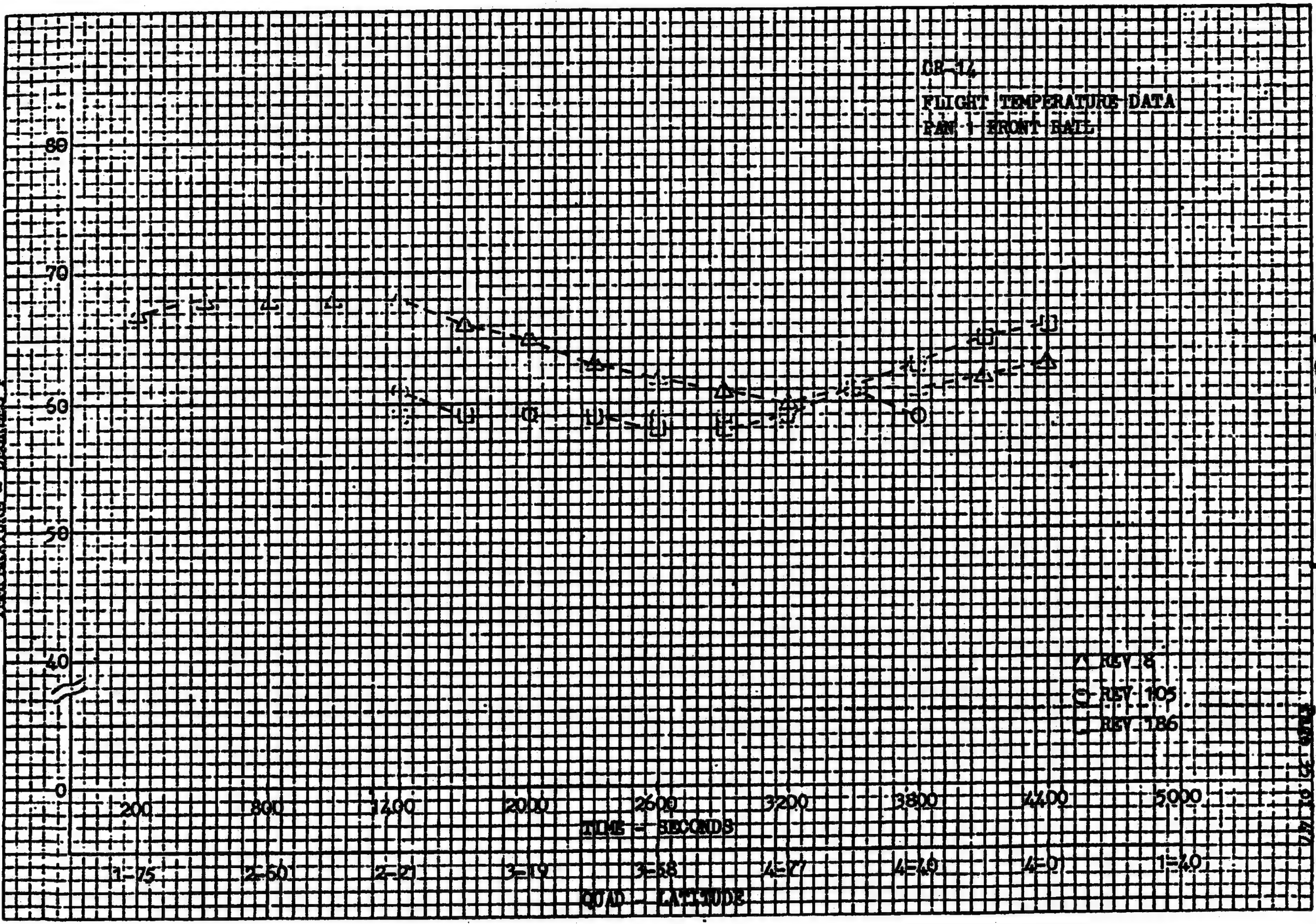

CR-14
FLIGHT TEMPERATURE DATA
PAN 1 FRONT RAIL
TEMPERATURE - DEGREES F
80
70
60
50
40
0
200
800
1400
2000
2600
3200
3800
4400
5000
TIME - SECONDS
1-75
2-60
2-21
3-19
3-58
4-77
4-40
4-0
1-40
QUAD - LATITUDE
△ REV 8
○ REV 105
□ REV 186

FIGURE 7.8.6

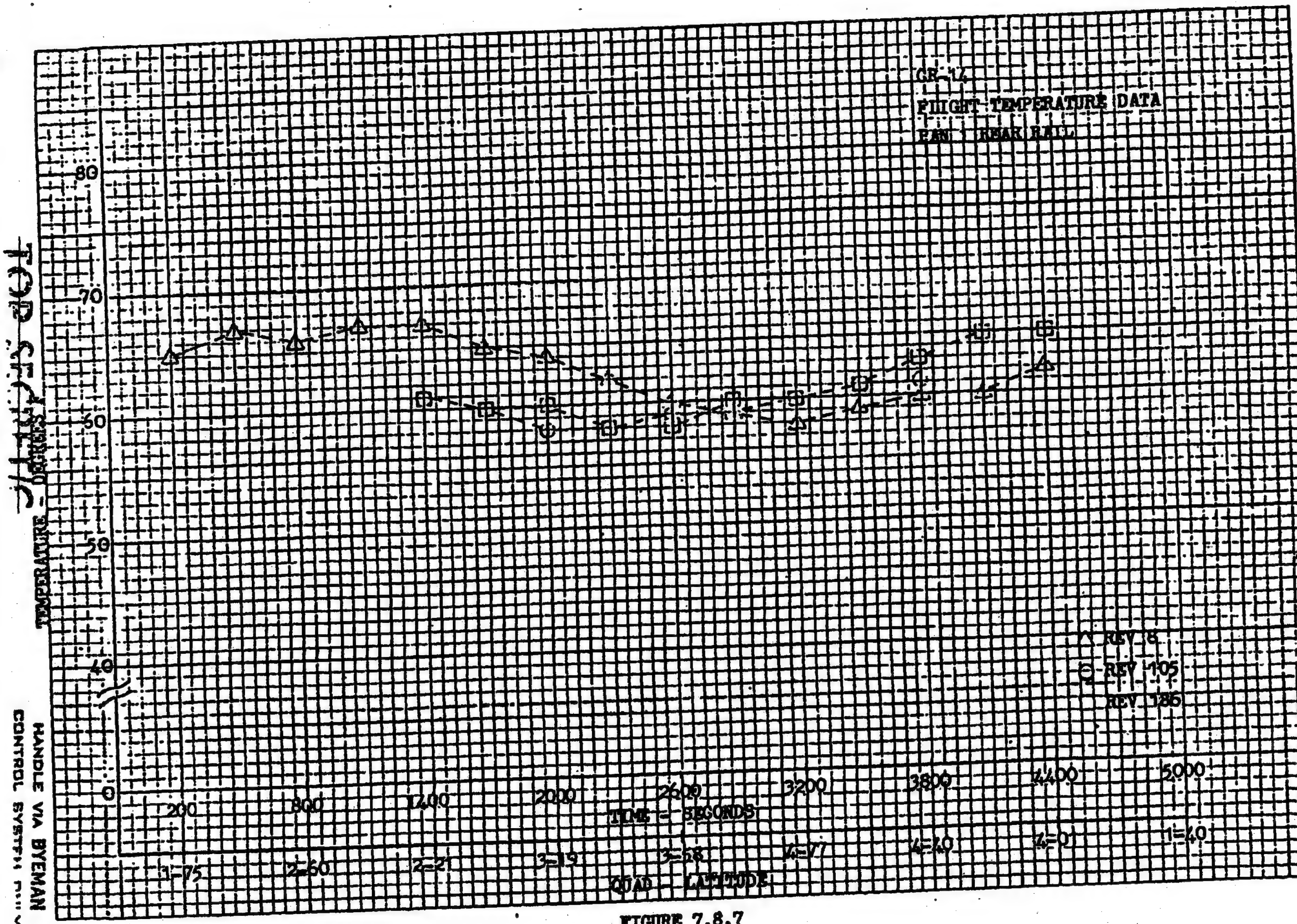

GR-14
FLIGHT TEMPERATURE DATA
PAN - REAR RAIL
△ REV 8
○ REV 105
□ REV 186
TEMPERATURE - DEGREES F
80
70
60
50
40
0
200
800
1400
2000
2600
3200
3800
4400
5000
TIME - SECONDS
1-75
2-60
2-21
3-19
3-58
4-77
4-40
4-01
1-40
QUAD - LATITUDE

FIGURE 7.8.7

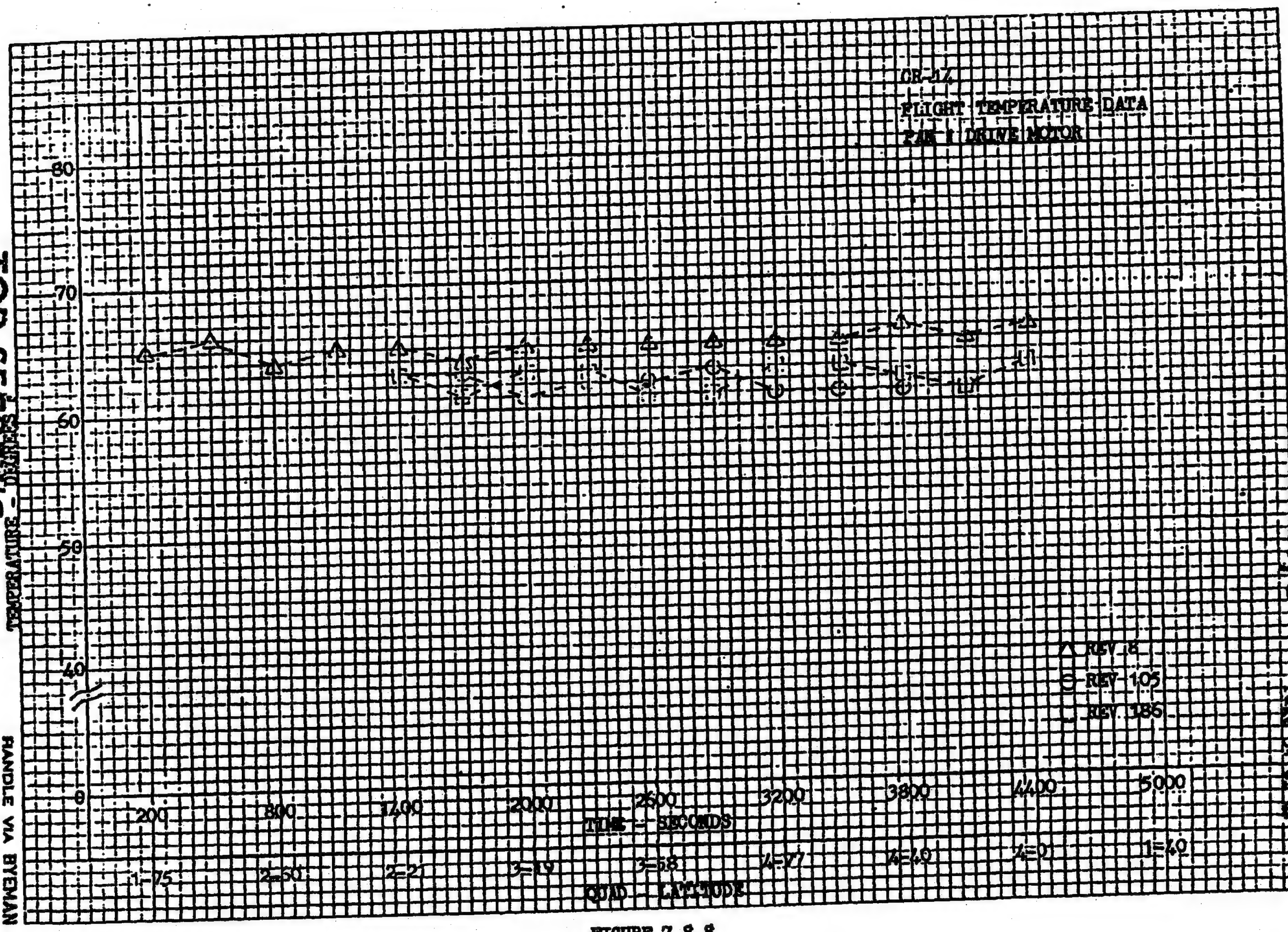

CR-14
FLIGHT TEMPERATURE DATA
PAN 1 DRIVE MOTOR
TEMPERATURE - DEGREES F
80
70
60
50
40
0
200
800
1400
2000
2600
3200
3800
4400
5000
TIME - SECONDS
1-75
2-50
2-2
3-19
3-58
4-77
4-40
4-0
1=40
QUAD - LATITUDE
△ REV 8
○ REV 105
□ REV 186

FIGURE 7.8.8

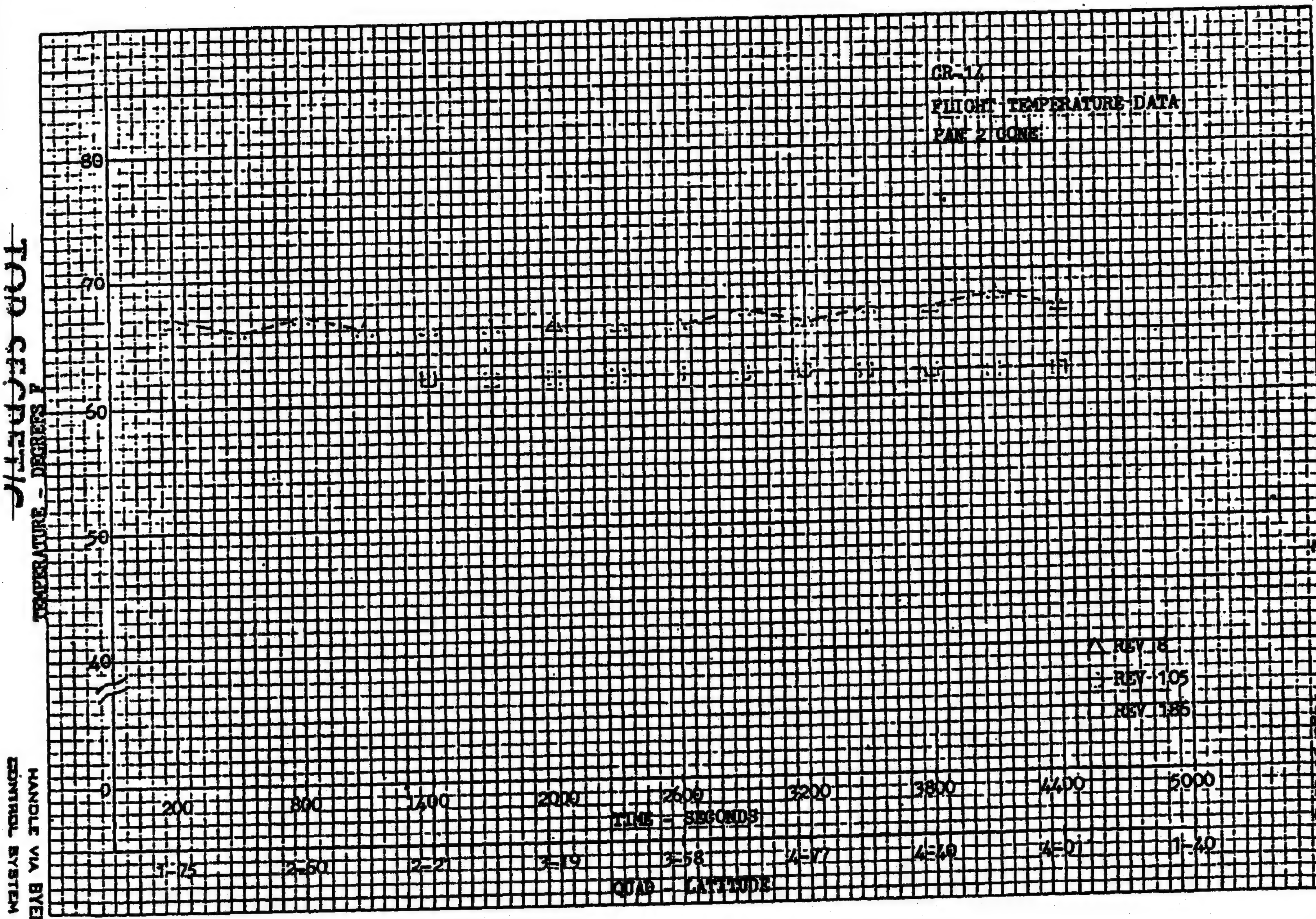


FIGURE 7.8.9

HANDLE VIA BYEMAN
CONTROL SYSTEM ONLY.

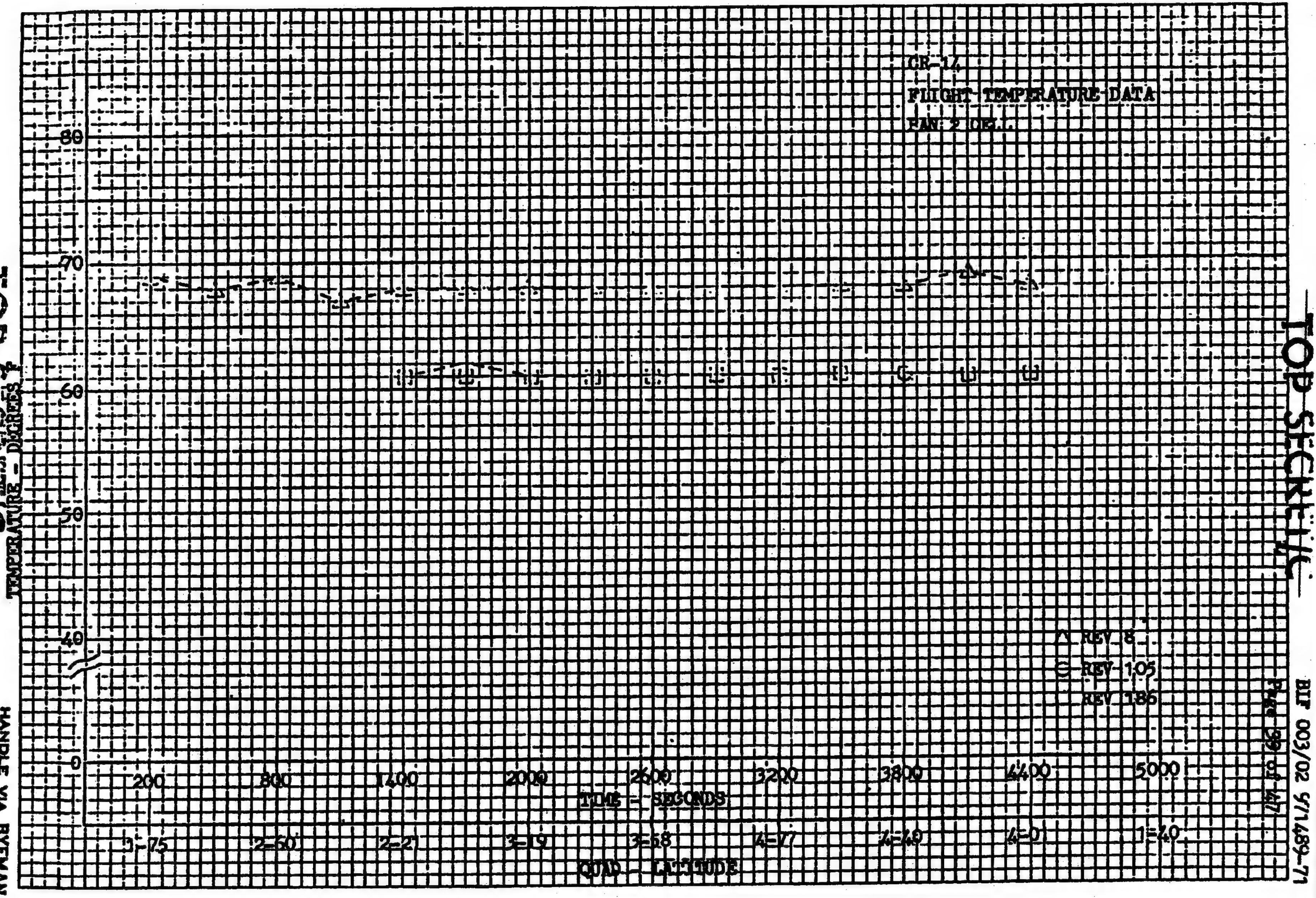

CR-14
FLIGHT TEMPERATURE DATA
FAN 2 OEL

FIGURE 7.8.10

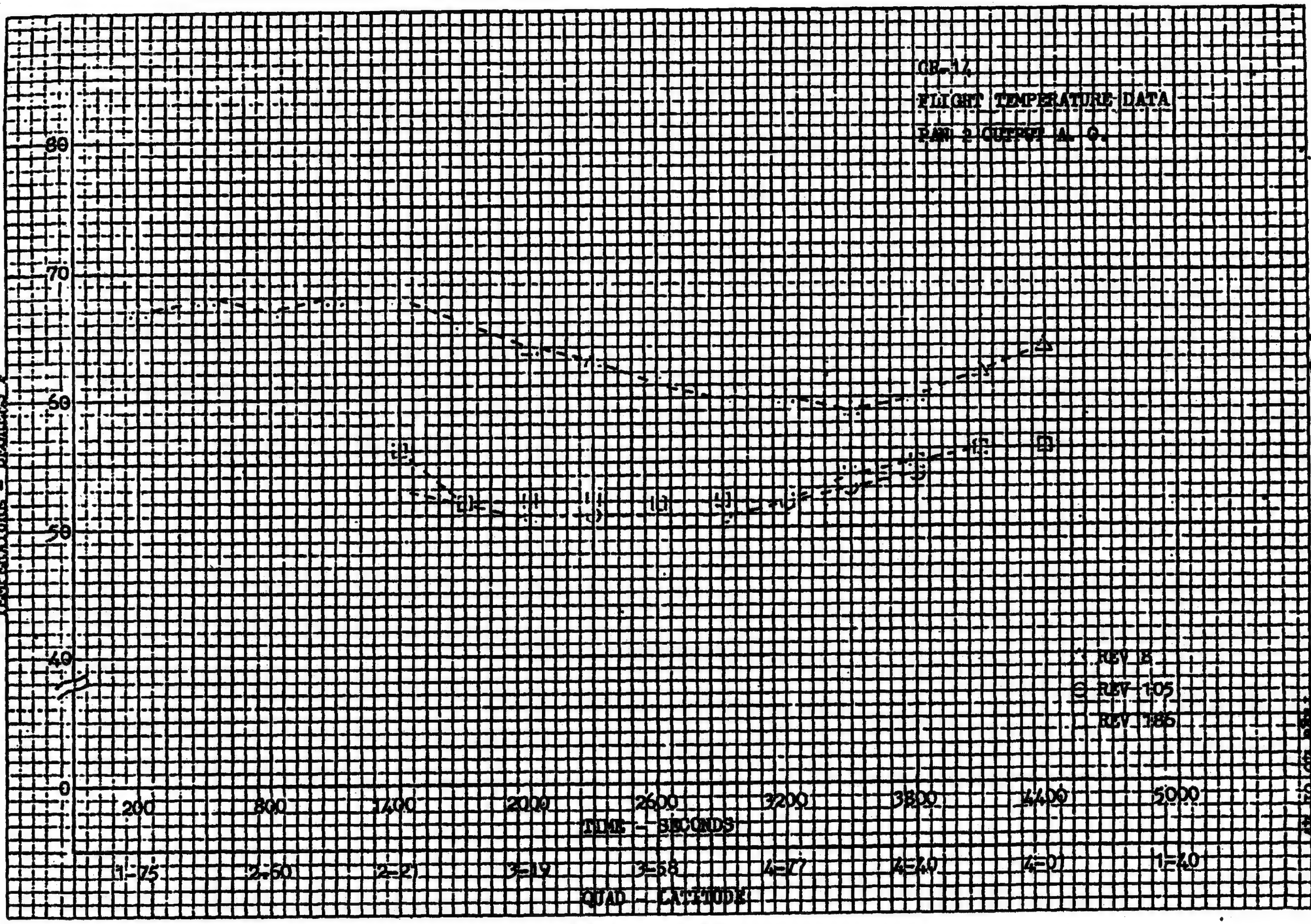

CR-14
FLIGHT TEMPERATURE DATA
PAN 2 OUTPUT A. Q.
80
70
60
50
40
0
TEMPERATURE - DEGREES
△ REV 18
⊙ REV 105
□ REV 186
200
800
1400
2000
2600
3200
3800
4400
5000
TIME - SECONDS
1-75
2-60
2-21
3-19
3-58
4-27
4-20
4-01
1-20
QUAD - LATITUDE

FIGURE 7.8.11

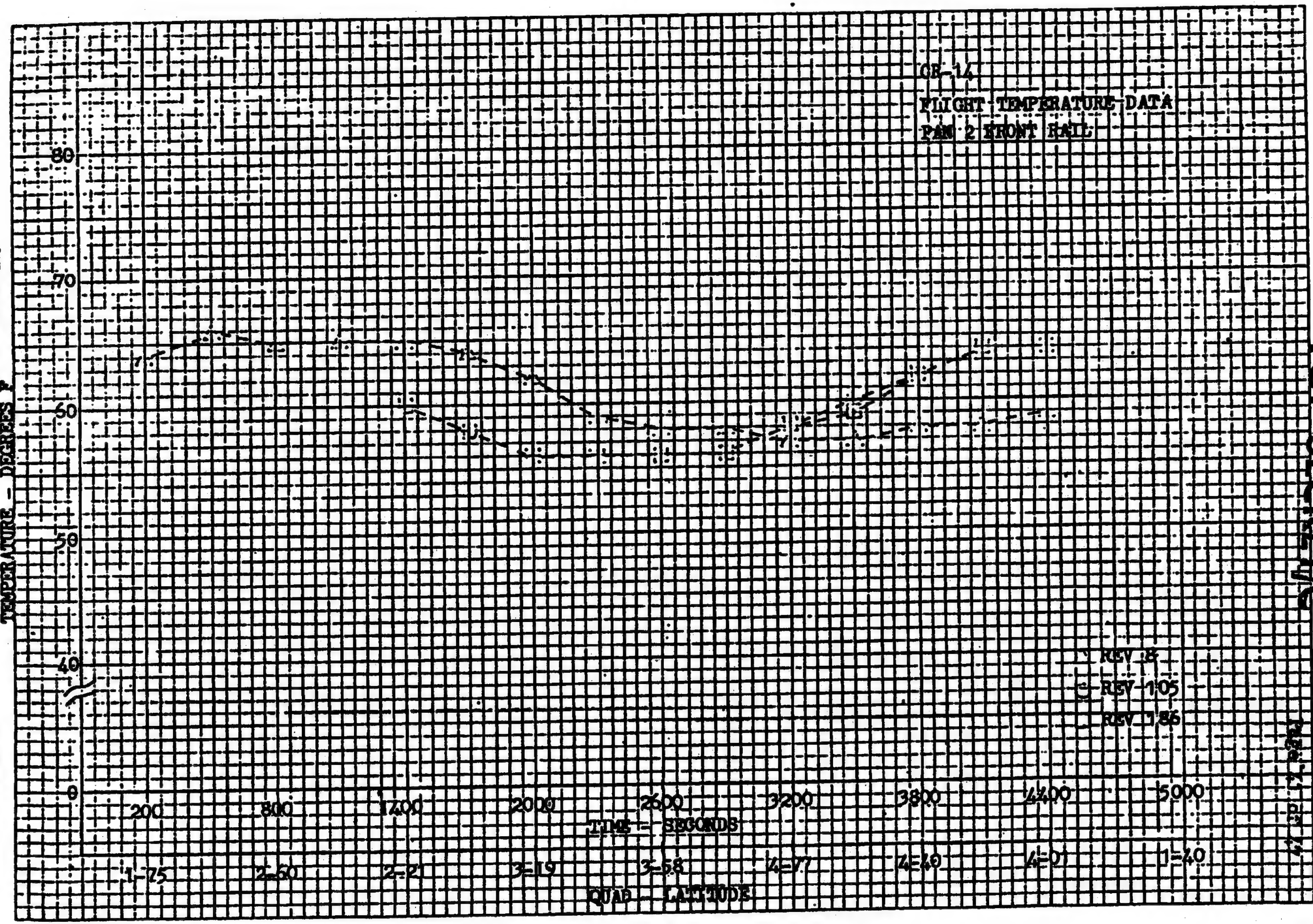

CB-14
FLIGHT TEMPERATURE DATA
PAN 2 FRONT RAIL
REV 8
REV 105
REV 186
TEMPERATURE – DEGREES F
80
70
60
50
40
0
200
800
1400
2000
2600
3200
3800
4400
5000
TIME – SECONDS
1-75
2-50
2-21
3-19
3-58
4-77
4-40
4-01
1-40
QUAD – LATITUDE

FIGURE 7.8.12

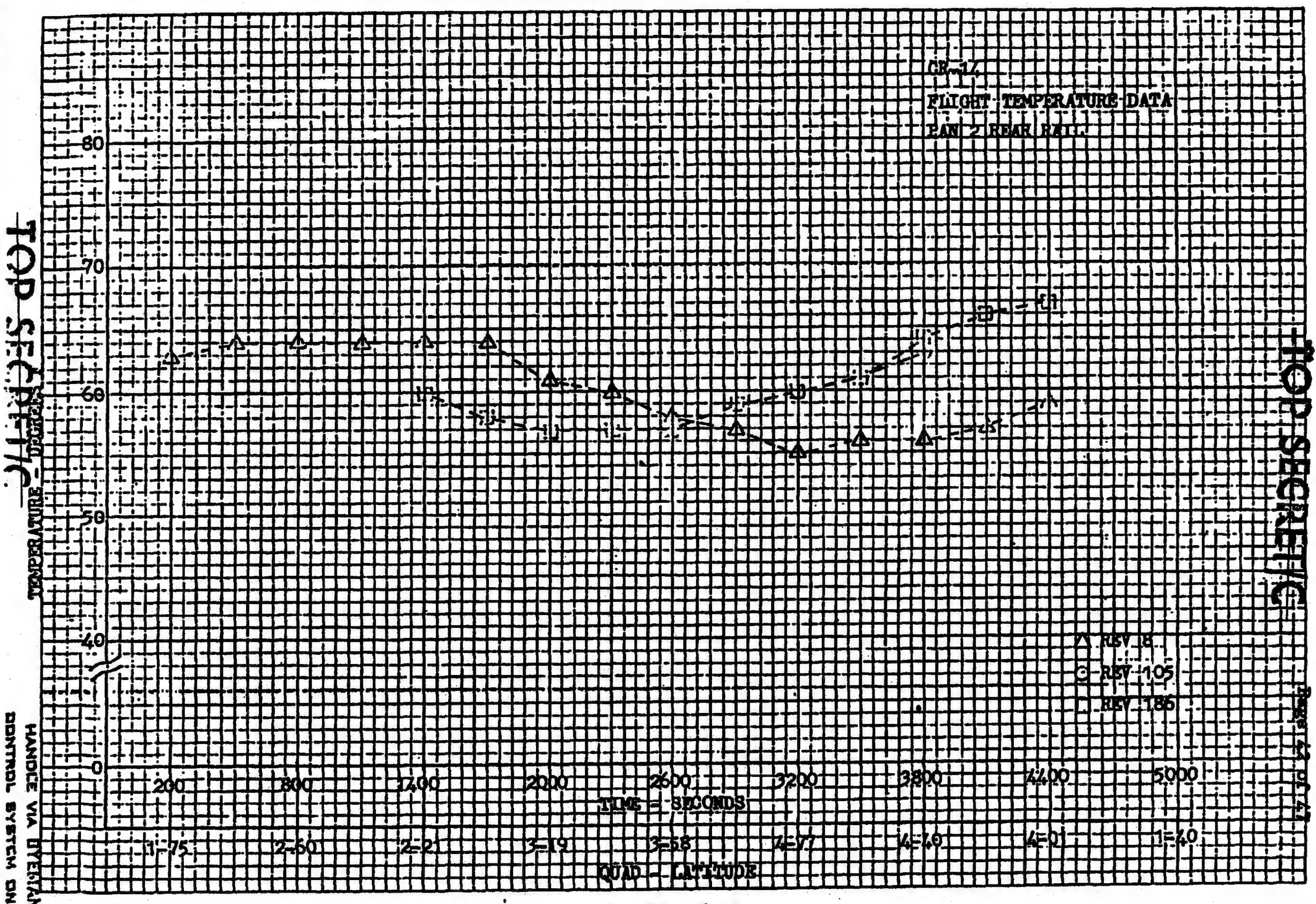

CR-14
FLIGHT TEMPERATURE DATA
PAN 2 REAR RAIL
80
70
60
50
40
0
TEMPERATURE - DEGREES
200
800
1400
2000
2600
3200
3800
4400
5000
TIME - SECONDS
1-75
2-60
2-21
3-19
3-58
4-77
4-40
4-01
1-40
QUAD - LATITUDE
△ REV 18
⊙ REV 105
□ REV 186

FIGURE 7.8.13

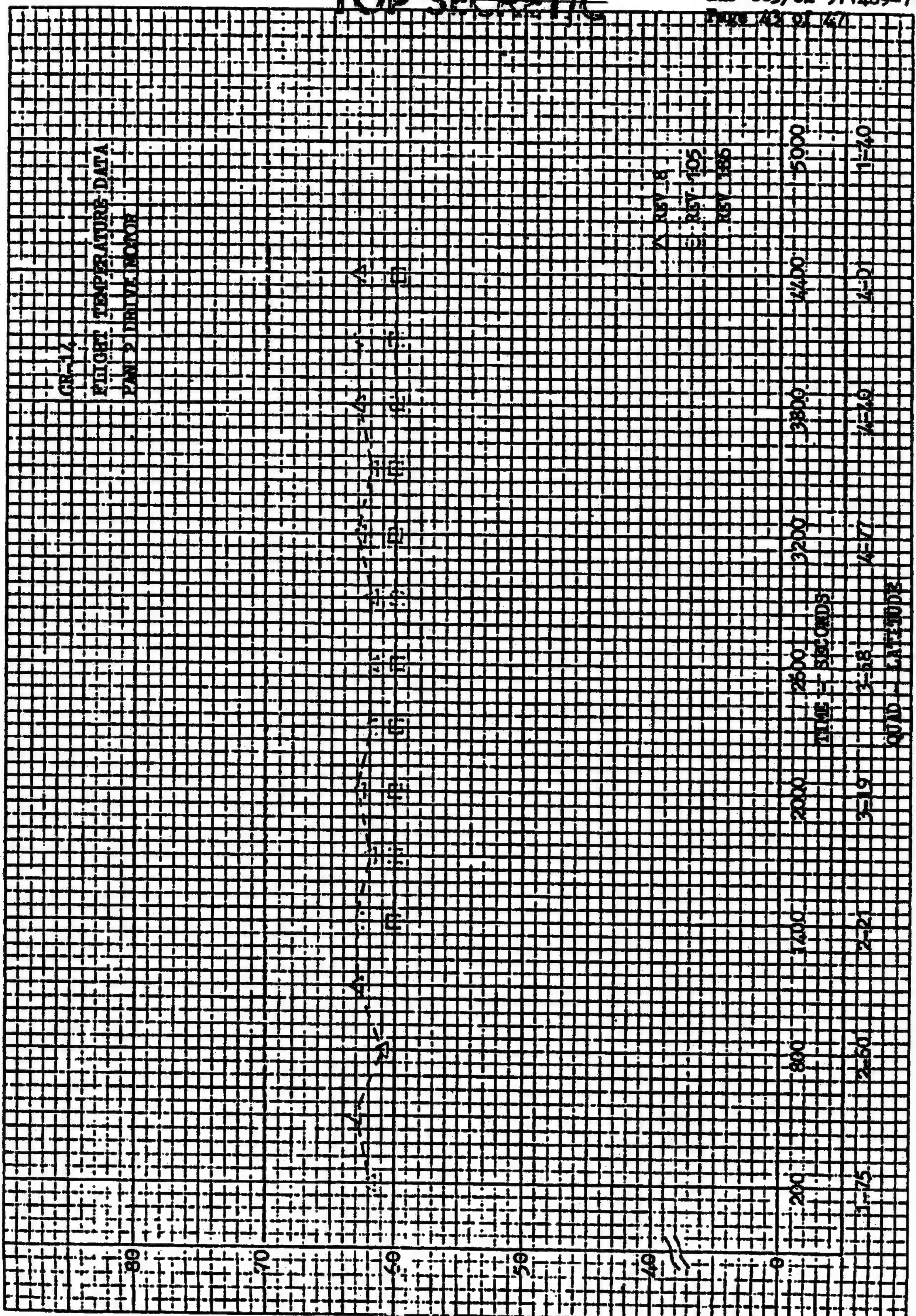


FIGURE 7.8.14

10 X 10 PER INCH DIETZGEN GRAPH PAPER NO. 340-10

TEMPERATURE SUMMARY (°F) (CR-6 & Up)

Payload CR-14

Rev. No.		9	16	25	32	41	48	57	64	73	81	89	97	106	113	122	129	138
Beta Angle		-19.3	-18.3	-17.1	-16	-14.9	-15.1	-12.6	-11.7	-10.4	-9.3	-8.2	-1.1	-5.8	-4.9	-3.6	-2.6	-1.4
Pan No. 1 Lens Cell	2	68	66	65	65	65	65	64	63	63	63	62	63	62	63	65	66	65
Lens Cone	4	69	67	66	66	65	65	64	63	63	63	62	63	62	63	64	66	65
Rear Rail	6	65	57	63	57	63	57	62	56	60	55	60	56	61	57	63	58	65
Drive Mtr	10	65	62	63	63	63	62	62	62	61	61	62	61	62	62	62	62	63
Front Rail	12	67	59	65	59	65	59	63	56	61	56	62	56	62	57	65	60	66
Average		67	62	64	62	64	61	63	60	62	60	62	60	62	60	64	61	65
Pan 1 Output AO	8	54	49	54	50	55	50	54	49	54	49	54	50	56	52	58	55	60
Delta Top Left	14	61	49	58	51	58	48	58	47	56	47	57	49	57	48	58	50	60
Drum Support	16	61	57	59	57	59	57	58	56	57	56	57	55	58	56	58	57	60
Pan No. 2 Lens Cell	18	67	66	66	65	65	65	65	64	64	63	63	64	63	63	65	66	65
Lens Cone	20	66	65	65	64	65	65	64	63	63	63	63	63	63	63	65	66	65
Rear Rail	22	63	54	62	56	63	55	63	55	61	55	61	55	62	55	62	56	63
Drive Mtr	26	63	61	62	62	62	61	61	60	60	60	60	59	61	60	61	61	62
Front Rail	28	63	55	62	57	63	56	63	56	61	56	61	55	62	56	61	57	63
Average		64	60	63	61	64	60	63	60	62	59	62	59	63	59	63	61	64
Pan 2 Output AO	24	68	60	66	60	66	59	65	57	62	57	61	55	61	55	60	55	60
Supply Cassette	30	57	54	58	56	60	57	60	57	59	58	60	57	61	58	60	58	62
Aux. Electronic Box	32	69	61	67	61	66	59	65	57	62	57	62	56	62	55	62	56	62
Slope Programmer	34	84	85	84	86	84	84	83	83	82	83	81	81	81	81	80	80	80
PMU	36	70	61	68	63	66	61	63	59	59	59	61	57	61	59	66	61	66
Switch Programmer	43	62	59	62	62	62	55	59	55	55	55	55	52	55	52	52	52	55
Aft Power Box	49	45	42	45	49	49	45	52	45	49	49	49	49	52	49	52	49	55
SRV "A" T/U	40	56	47	51	47	50	55	48	55	46	55	46	55	54	55	-	-	-
Retro	42	58	54	54	52	53	51	50	46	47	47	48	46	49	48	-	-	-
SRV "B" T/U	44	65	64	63	65	64	64	62	61	59	60	59	59	63	52	66	68	71
Retro	46	62	60	60	60	60	59	57	56	56	56	56	56	57	57	60	61	63

FIGURE 7.9.1

TEMPERATURE SUMMARY (°F) CR-6 & Up

Payload CR-14

Rev. No.		9	16	25	32	41	48	58	64	73	81	89	97	106	113	122	129	138
Beta Angle		-19.3	-18.3	-17.1	-16	-14.9	-15.1	-12.6	-11.7	-10.4	-9.3	-8.2	-7.1	-5.8	-4.9	-3.6	-2.6	-1.4
Blast Shield	48	53	46	49	49	49	42	46	39	39	42	42	39	42	42	29	91	25
	50	55	52	52	52	52	49	49	45	42	45	45	45	45	45	21	146	14
DISIC Platen	53	63	56	61	56	60	55	56	51	53	51	54	51	55	52	59	58	62
Lens Cell	55	54	47	51	47	51	45	46	42	43	42	44	42	45	43	50	50	52
Fairing	5	13	121	6	127	6	96	3	90	-4	90	3	104	3	98	0	104	0
	7	62	95	56	95	53	81	53	71	44	65	47	65	47	65	37	81	37
	9	32	85	28	82	25	79	25	69	22	60	25	57	25	63	19	72	19
	11	26	58	26	61	26	52	26	45	19	42	23	42	23	45	-10	164	-13
	13	38	41	38	48	35	41	35	35	32	38	35	41	38	48	32	64	35
	15	6	91	2	99	2	82	-1	79	-4	85	2	99	2	99	2	108	2
DISICONIC	17	-19	107	-26	118	-26	86	-26	86	-32	92	-26	109	-26	104	-22	107	-22
	19	67	83	60	83	60	73	54	64	48	64	51	57	51	57	51	64	51
	21	25	65	21	62	18	58	18	48	15	48	18	41	18	45	18	52	21
	23	15	47	11	51	11	44	11	38	8	41	11	38	15	41	15	47	18
	25	45	45	45	48	45	48	45	41	41	45	45	45	45	51	51	61	54
	31	3	87	0	95	0	77	0	80	-4	89	3	101	0	104	3	106	6
Forward Barrel	33	36	80	33	84	26	57	26	53	19	53	23	57	19	50	19	46	23
	35	26	56	26	56	23	49	23	42	16	42	19	36	16	39	19	42	23
	37	23	48	23	48	23	45	23	42	19	42	23	39	23	42	26	45	29
	39	-14	66	-17	82	-17	44	-14	50	-17	59	-14	82	-17	75	-14	79	-11
Aft Barrel	41	45	78	35	81	35	58	35	54	28	54	31	54	25	48	25	45	28
	45	31	67	27	64	27	61	27	57	24	54	27	47	24	51	24	51	27
	47	18	51	18	54	18	48	21	48	18	48	21	44	18	48	21	48	24
	51	-13	44	-16	51	-16	34	-13	40	-16	50	-10	67	-10	67	-6	70	-3
DSR	38	-	-	-	-	-	-	80	-	79	-	80	-	80	-	-	-	-

FIGURE 7.9.2

TEMPERATURE SUMMARY (°F) (CR-6 & Up)

Payload CR-14

Rev. No.		145	154	161	170	178	187	194	203	210	219	226	235	242	251			
Beta Angle		-.41	+.8	+1.81	+3.19	4.16	5.41	+6	+6.3	+8.6	+9.8	+10.81	+12	+13.02	+14.3			
Pan No. 1 Lens Cell	2	65	65	64	64	64	63	63	64	64	64	64	65	65	65			
Lens Cone	4	65	64	64	63	63	63	63	63	63	63	63	64	64	64			
Rear Rail	6	58	63	58	63	57	62	57	62	57	63	57	63	57	63			
Drive Mtr	10	62	62	63	62	62	62	62	62	62	62	62	62	62	62			
Front Rail	12	59	64	60	64	59	64	57	63	57	64	58	64	58	64			
Average		61	64	62	63	61	63	60	63	60	63	60	63	61	63			
Pan 1 Output AO	8	55	59	56	60	56	61	56	62	57	63	59	64	59	65			
Delta Top Left	14	50	58	51	57	48	58	48	58	47	59	49	60	48	58			
Drum Support	16	57	59	57	59	57	58	57	58	56	59	57	59	57	59			
Pan No. 2 Lens Cell	18	65	65	64	64	64	63	63	63	64	64	64	65	65	65			
Lens Cone	20	65	65	65	64	64	64	64	64	65	65	65	66	66	66			
Rear Rail	22	56	61	57	62	55	62	54	61	54	62	56	62	55	61			
Drive Mtr	26	61	61	61	61	61	61	60	60	59	61	60	61	60	61			
Front Rail	28	56	61	57	61	56	61	55	61	55	62	56	62	56	61			
Average		60	63	61	62	60	62	60	62	60	63	60	63	60	63			
Pan 2 Output AO	24	54	58	54	57	52	56	50	55	49	55	49	54	49	51			
Supply Cassette	30	58	61	59	62	59	62	59	62	58	63	60	63	60	63			
Aux. Electronic Box	32	55	60	55	59	53	58	52	57	51	57	52	57	51	55			
Slope Programmer	34	80	79	81	80	80	78	78	77	77	78	78	77	77	61			
FMU	36	59	63	59	63	59	61	57	59	55	61	55	59	55	61			
Switch Programmer	43	48	52	52	52	48	48	48	48	42	48	45	45	42	38			
Aft Power Box	49	49	55	52	58	52	58	52	58	52	61	55	61	55	61			
SRV "A" T/U	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Retro	42	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
SRV "B" T/U	44	69	68	69	68	67	68	66	66	64	66	66	66	64	65			
Retro	46	61	61	62	60	60	60	59	60	58	61	60	61	60	62			

~~TOP SECRET~~ FIGURE 7.9.3

TEMPERATURE SUMMARY (°F) CR-6 & Up

Payload CR-14

Rev. No.		145	154	161	170	178	187	194	203	210	219	226	235	242	251			
Beta Angle		-.41	+.8	+1.81	3.19	4.16	5.41	+6	+6.3	+8.6	+9.8	+10.81	+12	+13.02	+14.3			
Blast Shield	48	81	-	81	-	87	18	84	15	81	18	81	18	81	22			
	50	135	-	135	-	152	8	149	8	146	11	138	11	143	11			
DISIC Platen	53	57	56	55	57	54	56	52	54	51	57	53	56	52	54			
Lens Cell	55	49	46	46	46	44	46	43	44	43	47	44	46	44	45			
Fairing	5	101	0	101	-7	81	-7	81	-7	-4	-4	84	-4	71	-7			
	7	68	34	65	31	56	31	53	28	47	31	47	28	41	31			
	9	72	19	72	16	66	16	66	13	69	16	66	13	63	13			
	11	159	-10	165	-13	148	-16	151	-16	151	-16	168	-16	154	-16			
	13	67	35	77	35	77	32	80	32	87	38	95	38	98	41			
	15	110	2	113	-1	99	-1	102	2	102	6	119	6	108	6			
DISICOXIC	17	109	-26	112	-29	89	-26	92	-26	89	-22	104	-26	92	-26			
	19	57	48	54	44	48	41	44	38	38	41	38	38	38	38			
	21	52	18	52	15	45	15	45	11	48	15	45	11	41	11			
	23	51	18	54	15	47	15	51	11	57	15	54	15	51	15			
	25	61	54	67	54	70	54	74	54	77	57	83	61	86	64			
	31	112	6	118	3	104	6	109	6	109	10	123	10	115	6			
Forward Barrel	33	46	16	43	13	29	13	26	13	19	13	23	13	16	6			
	35	42	19	46	16	36	16	39	13	42	16	36	13	33	13			
	37	48	29	51	26	45	26	48	26	55	29	51	29	48	29			
	39	87	-11	93	-14	69	-11	75	-11	75	-4	80	-4	79	-7			
Aft Barrel	41	41	21	41	18	28	18	25	18	21	18	21	18	15	11			
	45	54	27	54	24	47	24	51	21	54	24	47	21	44	17			
	47	51	24	57	24	51	24	51	21	61	28	64	24	51	24			
	51	80	-6	87	-6	67	-3	77	-3	77	4	92	4	87	0			
DSR	38														80			

FIGURE 7.9.4